Assessing the Distribution of Benefits of Protected Areas to Northern Boundary Communities: A Case Study of Wood-Tikchik State Park Alaska

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ABSTRACT

Currently 15.4 percent of the earth's surface is designated as protected area. While these areas are primarily established for biodiversity conservation, these protected areas have the potential to provide many benefits, other than biodiversity conservation. Valuations of PPAs are often required as justification for continued protection or expansion of these areas. Previous valuation attempts and analysis of protected area benefits have been criticized for narrowness of scope, and lack of attention to the distribution of benefits across geographic populations.

The purpose of this study was to quantify and/or qualify the benefits, including both subjective and objective benefits, of Wood-Tikchik State Park (WTSP), Alaska, and analyze the distribution of benefits across identified stakeholder groups. WTSP is located in the Bristol Bay region of Southwest Alaska, and is the largest state park in the United States. To analyze the benefits, and the distribution of benefits, to stakeholders of WTSP a combination of secondary data, survey results of visitors to WTSP, and key informant interviews were used. Secondary data were collected from various Alaska State government departments on the value of commercial and subsistence salmon harvest originating from WTSP, and recreational visitors to WTSP. A pilot survey of visitors to a WTSP recreational fishing lodge was conducted to learn about trip characteristics and visitor expenditures in the region. Finally, semi-structured interviews were conducted in person and over the phone, with representatives of WTSP stakeholder groups.

The available secondary data allowed for the calculation of monetary values of WTSP, all directly or indirectly related to the presence of salmon in the region. These values were distributed across stakeholder groups. While non-monetary benefits were identified by all stakeholders, residents of local communities which access the park (boundary communities) identified the most benefits of importance. Wood-Tikchik State Park provides many benefits to different stakeholders, including boundary community residents. Being able to account for these benefits will be important for conservation of these areas, especially as demand for alternative land uses in the north grows.

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LIST OF ABBREVIATIONS

ADFG: Alaska Department of Fish and Game

ADNR: Alaska Department of Natural Resources

ASCR: Ashaninka Communal Reserve

BBEDC: Bristol Bay Economic Development Corporation

CAFF: Conservation of Arctic Flora and Fauna

CBD: Convention on Biological Diversity

CPAN: Circumpolar Protected Area Network

CSIS: Community Subsistence Information System

DPOR: Department of Parks and Outdoor Recreation

EPA: Environmental Protection Agency (of the United States)

FRI: Fisheries Research Institute

IUCN: International Union for the Conservation of Nature

NGO: Non-governmental organization

OECD: Organization for Economic Co-operation and Development

PA-BAT: Protected Area Benefits Assessment Tool

PPA: Park and Protected Area

RPBR: Rio Plantano Biosphere Reserve

TEK: Traditional Ecological Knowledge

UN: United Nations

WCPA: World Commission on Protected Areas

WTSP: Wood-Tikchik State Park

Chapter 1.

Brief Introduction

1.1. Overall Context

A protected area is a general term used to describe any geographical space that is classified under the IUCN (International Union for the Conservation of Nature) Protected Area Management Categories. These categories include nature reserves, national and state parks, and national monuments (Stevens, 2014). Historically, the primary and often exclusive purpose of protected areas was the conservation of the natural environment (Dudley et al., 2013). Currently 15.4 percent of the earth's land surface has protected area designation (World Conservation Monitoring Centre, 2016). The global expansion of protected areas has in many ways been informed by the belief that the most effective way to meet conservation goals is to protect wilderness areas from human activity (Stevens, 2014). This approach, often referred to as fortress conversation, has in many cases been implemented by force, resulting in the removal of human settlements and traditional activities. In certain cases the establishment of protected areas has caused human displacement, loss of local autonomy, restricted or eliminated access to livelihood resources, and barriers preventing continued cultural practices and social relationships, particularly in situations involving Indigenous peoples (Stevens 2014). Despite such strict state management and enforcement of these fortress conservation type areas, many protected areas have also failed to meet their conservation goals (Stevens 2014).

While protected area designation has been used as one of the primary methods to achieve biodiversity or conservation objectives, protected areas also provide other societal benefits (Stolton et al., 2015). For example, protected areas have contributed to the alleviation of rural poverty, have aided in achieving food security, and have helped to mitigate the impacts stemming from climate instability" (Dudley et al., 2013). The establishment of protected areas has proven to be a socially just and cost-effective way to deliver these services, while at the same time protecting the unique cultural and spiritual heritage of local communities (Stolton et al., 2010). Recognizing these societal benefits, some (e.g., Stevens 2014) have called for a reorientation in protected area management; one that is based on a 'new paradigm' of conservation that embraces local human involvement in management and conservation of protected areas. This new paradigm acknowledges the rights of local people to benefit more

directly from protected areas (Stevens, 2014). The inclusion of new paradigm principles is PPA management may encourage expansion or increase acceptance of protected areas (Augustine and Dearden, 2014).

Notwithstanding the benefits that protected areas can provide to local communities, the quantification or valuation of these benefits has proven elusive, particularly in trying to assess the distribution of these benefits across the stakeholder groups or individuals within communities themselves. Various methods have been used to assign value to protected areas, most all of which rely on the categorization of use and non-use values that ecosystems services provide (Putney, 2003). Yet the valuation of benefits can be a complex process, and disciplinary-based assessments often fall short of desired goals (Snyder et al., 2003). The limitations common to these assessments include narrowness of scope (Kettunen & ten Brink, 2013) and lack of attention to distribution of benefits (Kettunen & ten Brink 2013, see also Pabon-Zamora et al., 2008). Owing to the complexity, costs, and time commitment associated with comprehensive assessments (Task Force on Economic Benefits of Protected Areas of the World Commission on Protected Areas (WCPA) of IUCN, 1998), protected area assessments are often limited to problem or issue-based assessments, for example when the Republic of Croatia was considering the Coastal Forest Reconstruction and Protection project, an economic assessment was conducted for proposed protection sites to determine the value of the forests to the tourism industry (Task Force on Economic Benefits of Protected Areas of the World Commission on Protected Areas (WCPA) of IUCN, 1998). The calculated economic benefit for each forest area was used to inform decisions about protection of the proposed areas. Yet if an accurate and holistic assessment of the benefits stemming from protected areas is to occur, a combination of qualitative and quantitative methods needs to be employed in order to capture the full range and distribution of benefits that protected areas provide.

1.2. Objectives

The purpose of this research is to quantify and qualify the value of the benefits of Wood-Tikchik State Park (WTSP) in Alaska. Wood-Tikchik State Park (WTSP) is located in the Bristol Bay Region of Southwest Alaska. The sole access point of WTSP by road is 24 miles north of the city of Dillingham (ADNR DPOR, 2015a), and Dillingham can be accessed only by plane or boat from any other city. The area within WTSP boundaries is the traditional territory of the

Yu'pik people (Alaska State Parks, 2016). These lands and waters are used for subsistence hunting, gathering, and fishing (Alaska Department of Natural Resources: Division of Parks and Outdoor Recreation (ADNR DPOR), 2002). WTSP is the largest State Park in the United States. The land area within WTSP boundaries makes up almost half of total Alaska State Park land, and is equal to 15 percent of the land area designated as state park land in the entire United States (ADNR DPOR, 2015b). This research involved a mixed-method approach to analyzing the suite of values associated with the benefits that the WTSP provides to communities located along the parks boundary. More specifically this research set out to: (1) Estimate the value of recreational, tourism and other benefits (e.g. employment, concessions) generated from the WTSP, using monetary measures where possible; (2) determine the various non-monetary benefits that WTSP provides to boundary communities; and (3) analyze the geographical distribution of those benefits explicitly considering representative stakeholder groups.

This thesis is structured in the chapter style format, and consists of five chapters. The first chapter contains an overview of the context of this research and the research objectives. Chapter two reviews the literature that proved most informative to my research. Chapter three presents information about the research site and reviews the methodology used. Chapter four presents the research results and discussion. Chapter five contains conclusions as well as limitations, areas for future research, and a discussion of policy implications of my findings.

1.3. Introduction and Conceptual Framework

Since 1990, the global area designated as Park and Protected Areas (PPAs) grew from 13.4 million km^2 to over 32 million km^2. This area now accounts for 15.4 percent of the world's land area and 3.4 percent of the global ocean area (World Conservation Monitoring Centre, 2016). As defined by the IUCN, PPAs represent "geographical spaces, recognized, dedicated, and managed through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values" (Kettunen and ten Brink, 2013). Existing in every country in the world, PPAs store 15.2 percent of the global terrestrial carbon stock (Campbell et al., 2008, 1), have helped to reduce deforestation and habitat loss (Geldmann et al., 2013, 230), and support one billion people by providing livelihood needs (UN Environment, 2017).

In the State of Alaska, 120 state parks have been established. Alaska State parks are classified by the IUCN as Category II Protected Areas, and represent "large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and culturally compatible, spiritual, scientific, educational, recreational, and visitor opportunities" (International Union for the Conservation of Nature, 2017). Under this category, state parks in Alaska are managed to support a range of environmental conservation objectives while allowing human use for societal benefit (DeVaughn, 2010). Those societal benefits include direct gains, for instance employment or subsistence values, and less tangible benefits that may include the expression of spiritual or cultural values (Dudley and Stolton, 2009).

Economic theory has been applied to estimate values for a wide range of market and non-market benefits and costs, including those provided by PPAs. The economic value of PPAs has been delineated as use, and non-use values (Figure 1-1). Direct use values represent those values provided by the direct use of the environmental benefits including consumptive use of environmental provisions like food, water, and natural medicines, as well as non-consumptive uses such as aesthetic enjoyment or tourism, and the value of having the option to use the benefit in the future (Dixon 2005). Indirect use values represent values provided through indirect environmental benefits and services such as pollination of plants, water filtration services, and habitat. Finally, non-use values represent values held by society that are not linked to use of environmental benefits and include existence value and bequest values: the value one gains by simply knowing something exists, and will continue to do so for future generations (Dixon 2005).

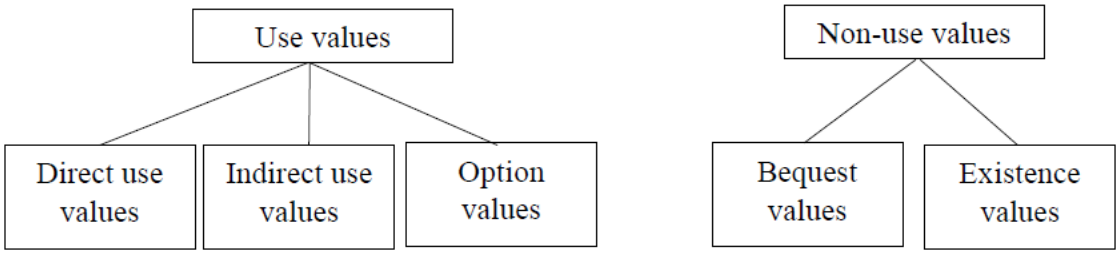

Figure 1-1: Components of Total Economic Value

The total economic value of any specified area is often important in the consideration of welfare implications of decision making that affects land and resources. The management or

development option for an area with the highest total economic value would be the option that provides the greatest increase in welfare to society (Freeman III, 2003). Attempts to quantify the economic benefits PPAs have become increasingly necessary as land and resource allocation decisions between competing, and sometimes conflicting, land uses intensify (e.g. mining leases vs. PPA). Valuations are often necessary to show the economic returns of PPAs on local or state economies, and as justification by proponents for the continued support and expansion of PPAs.

In northern Canada, PPAs have been pitted against resource extraction proposals as vehicles for sustainable regional economic development, strategies for economic diversification, and means by which to protect the land-based cultures of northern communities (Thompson and Peepre, 2007). Estimating the value of PPAs using monetary measures has shown that PPAs do, in some cases, result in significant economic returns. For example, in Alaska, Goldsmith and his colleagues (1998) assessed the annual economic value of the three national wildlife refuges in the Bristol Bay area. The three refuges were found to support 3,225 annual jobs, and generated a total annual personal income for all individuals impacted by the refuges of US$126.8 million (Goldsmith et al., 1998). The annual economic use value of the three refuges was further estimated to be US$82 million, and the non-use value ranged between US$2.3 and $4.6 billion (Goldsmith et al., 1998). In a similar study, Fay and Christiansen (2012) estimated that the annual economic impact of visitation to Alaska's Katmai National Park and Preserve was approximately US$50 million, supported 647 jobs, and added US$37 million annually to the Alaska state economy (Fay and Christensen, 2012).

While these studies lend evidence to the argument that PPAs provide important economic returns, the methodologies often used have been criticized for being narrow in scope (Kettunen and ten Brink, 2013) and lack critical attention to the distribution of economic benefits (Pabon-Zamora et al., 2008). When considered entirely, the total economic value framework (Figure 1-1) encompasses the wide variety of benefits PPAs can provide. However, all components of the total value framework are not always included in assessments, as it is not always possible to assign monetary values to all components of the total economic value. Therefore, when assessments are conducted with the goal of establishing a monetary value for comparison, other non-monetary benefits are often excluded, leading to a narrowness of scope brought about explicitly as a result of the methodology of the assessment. While determining the economic

value of protected area benefits has proven useful, generally only the use values have been considered, while the regional distribution and calculated benefits between stakeholder groups are overlooked.

In response to this criticism, this paper provides an analysis of the distribution of benefits stemming from Wood-Tikchik State Park (WTSP) in western Alaska. The primary benefits analyzed include monetary estimates of direct use benefits provided by WTSP, as well as the distribution of other non-monetary use and non-use benefits among regional stakeholder groups. This will be the first analysis of the monetary and non-monetary benefits of WTSP that amalgamates the various data sources available, supplemented by survey data and key informant interviews to analyze the scope and distribution of benefits.

Chapter 2.

Literature Review

2.1. Introduction

This literature review describes the variety of benefits that protected areas can provide, focusing on the ecosystem services framework. I then review the methods that have been used to value the benefits associated with ecosystem services. This review covers studies from multiple disciplines that assign value to ecosystem services and have assessed the impacts of protected areas on boundary communities. This includes an examination the historical and current impacts of protected areas on boundary communities around the world, including the conservation management paradigms which influence protected area management. Finally, a discussion focusing on the establishment, purpose, and value of protected areas in Alaska will be presented.

2.2. Benefits of Protected Areas

Protected areas are often used as tools by governments to achieve conservation and biodiversity goals (Stolton et al., 2015). However, conservation is only one component in the wide range of services and values that protected areas can provide. De Groot (1987) argued for the inclusion of environmental benefits in economic decision making on the premise that, like market goods and services, environmental goods and services are important to human welfare. De Groot proposed that these benefits from environmental functions needed to be better accounted for when weighing development versus conservation objectives (de Groot 1987). While the benefits identified by de Groot (1987) were primarily tangible benefits as they related to human welfare, benefits of protected areas can also include intangible values.

Benefits of protected areas can be described as the positive (affirmative) values that protected areas provide. Tangible values can be strictly defined as "that which has worth: something of merit, something estimable-whether or not such worth is assigned or recognized by humans" (Harmon & Putney, 2003). Intangible values are better defined as "that which enriches the intellectual, psychological, emotional, spiritual, cultural, and/or creative aspects of human existence and well-being" (World Commission on Protected Areas, 2000).

Following the Conference on Conservation and Development (Ottawa 1986), a recommendation was made that in order to achieve conservation goals, environmental goods and

services should be accounted for (de Groot 1987). Since then, multiple frameworks have been developed to more specifically categorize benefits derived from protected areas, and ecosystems in general. In 2003, the Ecosystems Services framework was proposed in the Millennium Ecosystem Assessment (Figure 2-1). This framework, now commonly used in examining protected areas, separates benefits into supporting services, provisioning services, regulating services, and cultural services.

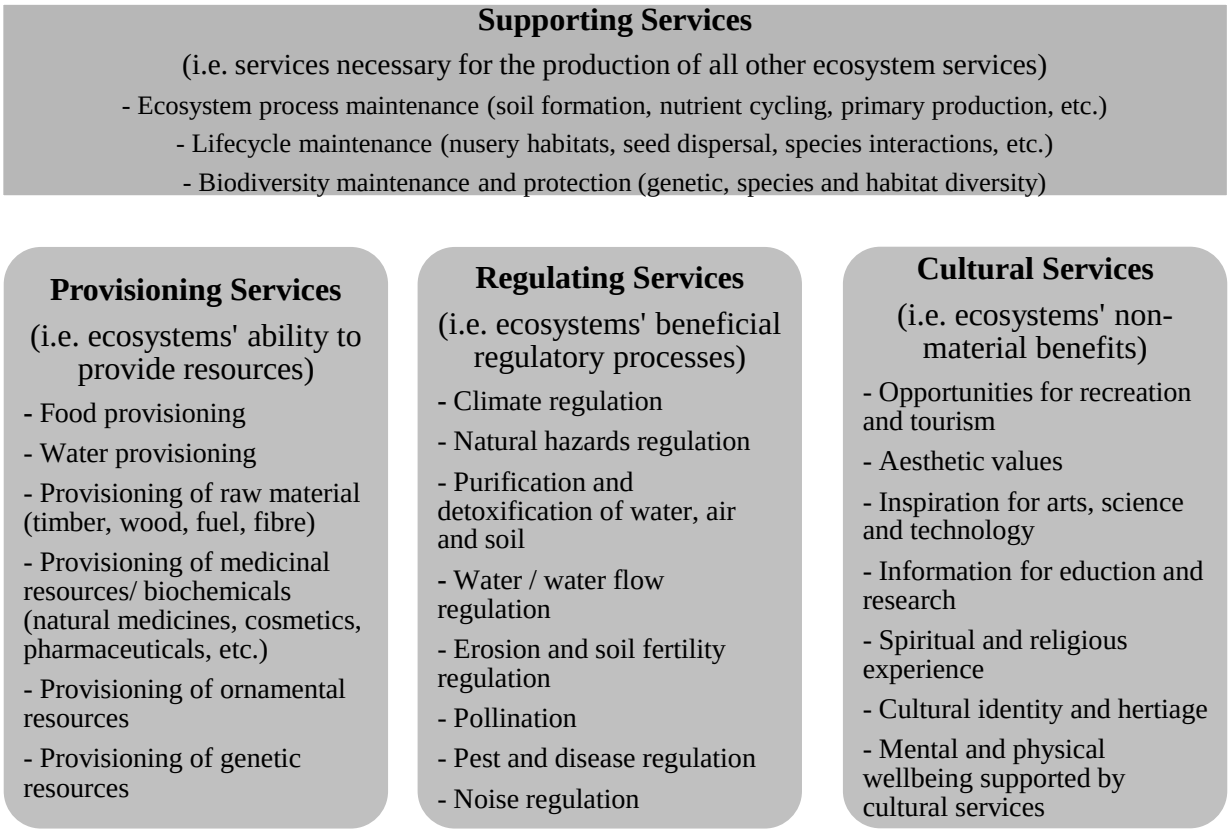

Figure 2-1: Commonly recognized ecosystem services and related goods from protected areas (Kettunen and ten Brink 2013, 15)

Drawing on this framework of classifying benefits, a typology was developed for the *Arguments for Protection Series* (World Wide Fund for Nature), Stolton et al. (2010) that identified a number of themes that could be used to measure the benefits that communities derive from PPAs. These themes include:

- Biodiversity protection
- Water
- Food
- Health and recreation

- Disaster mitigation
- Climate change mitigation and adaptation
- Cultural and spiritual values
- Materials
- Knowledge
- Political Stability

The Ecosystem Services Framework, and the categorical themes of benefits of protected areas, form a comprehensive starting point for the identification of benefits of any protected area under examination. The importance of assessing protected area benefits has become more prominent in conservation dialogue. The Millennium Ecosystem Assessment (2005) reported that 60 percent of global ecosystem services are "being degraded or used unsustainably" (Pabon-Zamora et al., 2008, 6). Then, in 2008, the OECD reported finding a significant underinvestment in protected areas (Pabon-Zamora et al., 2008).

While the Ecosystem Services Framework has been widely used, there are critiques of the framework and its use in decision making, Chan et al. (2012) criticized ecosystem services approaches to valuation, primarily in the treatment of cultural services. While cultural services are included in the Ecosystem Services Framework, the attention these values have received, and the primary economic valuation of these cultural services have been insufficient (Chan et al., 2012). This treatment of cultural services impacts the accurate inclusion of cultural services in decision making based on ecosystem services. They propose a greater integration of other valuation techniques and social perspectives to the ecosystem services framework to address the caveats of the framework (Chan et al., 2012). There have also been other critiques with the framework, stemming from its' application in decision making. Economic valuation of ecosystem services inherently limits the application of the framework, as can the expertise and mindset of those conducting the analysis (Chan et al., 2012; Satterfield et al., 2013).

Despite the complexity of understanding and valuing all services protected areas can provide, managers are now being expected to include these services in their management plans and objectives (Pabon-Zamora et al., 2008). The Ecosystem Services Framework provides a categorization of the different ecosystem services, and while there are inherent assumptions and caveats in the Ecosystem Services Framework, it is a basis for managers to attempt to include these services in decision making.

2.3. Valuing Protected Area Benefits

Much of the research considering the value of protected area benefits involves at least one of three approaches: qualitative assessment, quantitative assessment, or monetary assessment. Protected areas are valued by different segments of society for different reasons (Putney, 2003). Values assigned to protected areas can be in the form of use-values, or non-use values (Dixon, 2005). The majority of these values are utilitarian "that is, based on whether or not something is useful to humankind" (Putney 2003, 5). Even intangible values can be utilitarian, as they lose meaning without human context. Use values of protected areas can be from direct use or indirect use. Direct use values include consumption of environmental provisions like food, water or natural medicines, as well as non-consumptive uses like aesthetic enjoyment or tourism (Dixon, 2005). Indirect use values include services such as pollination of plants, water filtration services, and habitat. Finally, non-use values, which are the most difficult to account for and quantify, include existence value and bequest values (Dixon, 2005). These non-use values refer to the value an individual gets simply from knowing something exists, or that it will exist for future generations.

While identifying the presence of environmental benefits from protected areas is a simple process, these benefits must also be valued to be included in decision making. Costanza et al (1997), estimated the economic value of 17 ecosystem services for the entire biosphere to be an average of US$33 trillion per year. However, valuation of these services is not simple, and can be controversial. Arguments have been made that it is impossible to place a dollar value on intangible values, and that ecosystems should be protected for moral reasons, not for economic reasons (Costanza et al., 1997). Where decisions must be made, Costanza et al. (1997) argue that whether or not to value environmental benefits is not a choice to be made. Rather, valuation of environmental benefits should always occur, and the decision which must be considered is whether or not to be explicit about the valuations made, and the uncertainties that accompany the valuation.

The need to value the benefits that protected areas provide to conservation and human well-being is growing more urgent (Pabon-Zamora et al., 2008). The valuation of environmental benefits is considered critical to the social, economic and ethical management of PPAs (Putney, 2003).

A variety of methods have been used for the economic valuation of ecosystem services. Economic value is an important concept for the consideration of environmental services in policy, development, and investment decisions. The decision rule often employed by decision makers is the choice that maximizes human well-being. The measure of well-being is a monetary equivalent of economic value, which is derived from the market values of the goods and services influencing well-being (Freeman III, 2003). However, environmental goods and services are not all traded on markets, where there is a direct exchange of financial compensation for the good or service. Therefore, approaches have been developed to assign monetary value to these impacts, so they can be included in welfare analysis to quantify the tradeoffs imposed by different management or development decisions (Freeman III, 2003). Economic methods for valuing environmental goods and services include market based measures and non-market based measures. The method employed in any analysis will depend on available data and the specific objectives of the analysis. Stolton et al. (2010) compiled a comprehensive table of the different economic valuation methods, approaches, application and limitations (Table 2-1).

Table 2-1: Valuation Methods, Approaches, and Limitations (Stolton et al. 2010, 58-59).

VALUATION METHOD	APPROACH	APPLICATIONS	EXAMPLES	LIMITATION
Market price	Observe process directly in markets	Goods and services from protected areas that are traded in markets	Timber and fuelwood from forests; water resources	Market process can be distorted, e.g. by subsidies. Protected area services often not traded in markets.
Replacement cost	Estimate cost of replacing environmental service with human-made service	Ecosystem services that have human-made equivalent that could be used and provides similar benefits to the environmental services	Coastal protection by mangroves, water storage and filtration in forests and wetlands	Over-estimation of value if society not prepared to pay for human-made replacement. Under-estimates values if human-made replacement does not provide all the benefits of the environmental service
Damage cost avoided	Estimate damage avoided due to ecosystem service	Ecosystems that provide protection to infrastructure and other assets	Landslide/avalanche protection from forests, wetland protecting against flood	Difficult to relate damage levels to ecosystem services

Net factor income	Revenue from sales of environment-related good minus cost of other inputs	Ecosystems that provide an input in the production of a marketed good	Filtration of water by wetlands, commercials fisheries supported by nursery areas protected by coral reefs	Over-estimates ecosystem values
Production Function	Estimate value of ecosystem service as input in production of marketed goods	Ecosystems that provide an input in the production of a marketed good	Commercial fisheries supported by nursery areas protected by coral reefs, materials used in handicraft production	Technically difficult. High data requirements
Hedonic Pricing	Estimate influence of environmental characteristics on price of marketed goods	Environmental characteristics that vary across goods	Air quality, scenic beauty, cultural benefits	Technically difficult. High data requirements.
Travel cost	Travel costs to access a resource	Sites used for recreational purposes	Protected areas	Limited to recreational benefits; hard to use when trips are to multiple destinations
Contingent valuation	Ask respondents directly the amount of money individuals are willing to pay for a specified service	Any environmental good or service	Species loss, protected areas, air pollution, clean water	Expensive to implement
Choice modelling	Ask respondents their willingness to pay for their preferred environmental goods or services from a set of alternatives with particular attributes	Any environmental good or service	Species loss, protected areas, air pollution, clean water	Expensive to implement. Technically difficult.
Value transfer	Use values estimated at other locations	Any environmental good or service when comparison studies available	Species loss, protected areas, air pollution, clean water	Can be inaccurate, as factors vary even when contexts seem 'similar': should be used with caution.

Hein (2011) estimates the economic benefits of a protected area using the Hoge Veluwe Forest, the Netherlands, as a case study. Through interviews and literature review the primary ecosystem services provided by Hoge Veluwe to be valued were identified as: "(1) wood production, (2) supply of game (wild boar and deer), (3) groundwater infiltration, (4) carbon

sequestration, (5) air pollution removal, (6) recreation, (7) recreational hunting, and (8) biodiversity conservation." (Hein, 2011, 14). A variety of valuation methods were used to calculate the consumer or producer surplus for each ecosystem service. These methods included: total revenue minus production costs, replacement cost, damage cost avoidance, and the travel cost method (Hein, 2011). The results of this analysis found the value of the benefits from Hoge Veluwe to be 2000 Euro/ha per year (Hein, 2011).

Heberling and Templeton (2008) consider the recreational value of Great Sand Dunes National Park and Preserve, Colorado, to visitors. Using a combination of secondary data collected by the National Park Service and on-site survey data they estimate a travel cost model for the valuation of recreation (Heberling & Templeton, 2008). The survey data set included 314 observations, and the consumer surplus was estimated to be US$89 per person per year who visit Great Sand Dunes National Park and Preserve as their sole destination (Heberling & Templeton, 2008).

Heagney, Kovac, Fountain, and Conner (2015) examine the socio-economic benefits to local communities in Australia by conducting an analysis of 10 socio-economic indicators from 2000-2010 for 110 different communities (Heagney et al., 2015). All communities are located in the New South Wales region, an area which has around 860 national parks and reserves (Heagney et al., 2015). The results showed significant effects on eight of the10 economic indicators for protected area land acquisitions (Heagney et al., 2015). Providing quantitative evidence that protected areas can benefit local communities economically in the developed world (Heagney et al., 2015).

Non-economic approaches to the valuation of environmental goods and services are more difficult to categorize. Many non-economic analyses attempt to articulate the intangible values of PPAs. In an attempt to better account for the range of values of protected areas, the World Commission on Protected Areas (WCPA) created a Task Force on Non-Material Values (Putney, 2003) that developed a categorical list of intangible values including: recreational, spiritual, cultural, identity, existence, artistic, aesthetic, education, research, peace, and therapeutic values (Putney, 2003).

Brown, Hausner, and Laegreid (2015a) examined the implications of physical landscapes and ecosystem values on spatial value transfer, using empirical data from Norway. While

ecosystem values and ecosystems services can be used interchangeably in some literature, "mapped ecosystem values identify the spatial location of ecosystem services" (Brown et al., 2015a, 19). Study participants in Nordland and Sogn were asked to assign ecosystem values for different land cover classes (Brown et al., 2015a). Their study found that while subsistence and provisioning value were found in forested areas, those same areas also supported identity and place-based values. At a finer scale Brown et al. (2015s) also found that upland areas of the forest provided additional values, such as scenic and intact area values, that were not necessarily found in other areas of the same forest (Brown et al., 2015a). It was also found that value transfer – or the transferring of ecosystem values based on spatial associations to other regions was unreliable, given the complexity of human value formation and the need for place-based policy formation (Brown et al., 2015a).

Lin and Lockwood (2014) used protected areas as a context for examining sense of place, particularly as it relates to spatial extent and the forms of sense of place in the State of Tasmania, Australia (Lin & Lockwood, 2014). Sense of place is considered a cultural service under the ecosystem services framework. Lin and Lockwood (2014) conducted a thematic analysis of interview transcripts with study participants, and found that attachments to specific geographic locations were related to cultural and physical values, as well as social experiences. Place attachment was not only associated with specific locations, some participants also showed generalized attachment to types of physical locations (Lin & Lockwood, 2014).

Palomo et al. (2011) applied a participatory scenario planning framework to the Doñana protected area in Spain. This framework was used to explore the social perceptions of ecosystems services and to develop management strategies. Semi-structured interviews, questionnaires, and scenario workshops were used to analyze ecosystem services in the Doñana protected area (Palomo et al., 2011). The three types of ecosystem services reported from the study included cultural services, provisioning services, and regulating services (Palomo et al., 2011). The vulnerability of ecosystem services in the region was also analyzed to identify the most critical ecosystem services. The specific services with the highest use and vulnerability were agriculture and gratification of biodiversity conservation (Palomo et al., 2011).

While much of the literature around valuing ecosystem services considers a single disciplinary focus, some studies have attempted to join anthropological and economic methods.

In 2003, Snyder et al. (2003) examined the relationship between resource valuation methodologies and the treatment of cultural loss. They concluded that neither economics nor anthropology can adequately address cultural loss and sense of place when used alone. To rectify this, the authors recommended a multidisciplinary approach, synthesizing the strengths of each approach and reducing the disciplinary limitations (Snyder et al., 2003, 119). The concept of cultural loss can include cultural services more broadly, which are components of the ecosystem services framework.

McDaniels and Trousdale (2005) employed a multi-attribute based analysis to "characterize culturally significant values of indigenous people regarding resource damages" (McDaniels & Trousdale, 2005, 174). This method was used to understand non-market losses in three Metis communities in Alberta, Canada (McDaniels & Trousdale, 2005). Through a valuation workshop with community members, values at risk from non-renewable resource development were identified and ranked, and the best and worst case descriptions of the impacts on those values were compiled (McDaniels & Trousdale, 2005). The ranking of those values were then used to assign weights, which were used to calculate a monetary value of the losses. Traditional values were most highly ranked by the community, and economic values ranked last, with the total monetary value of CAD$2.6 million in non-market losses due to resource damages (McDaniels & Trousdale, 2005).

To assist in the development of a standard approach to understand protected area benefits and values, Kettunen and ten Brink (2013) produced an assessment guide which details a step by step approach to social and economic benefits of protected areas. The three main steps in identifying and assessing the benefits of any protected area are: (1) Completion of a scoping assessment, during which a rapid preliminary assessment of potential ecosystem services and their relative importance are identified, (2) Valuation of socio-economic benefits, where specific methodologies are selected based on objectives to determine qualitative, quantitative, and/or monetary value, and (3) Interpretation and communication of the results of the assessment and valuation (Kettunen & ten Brink, 2013, 7).

To assist protected area managers in the identification and valuation of protected area benefits, Stolton and Dudley (2009) created the Protected Area Benefits Assessment Tool (PA-BAT) as part of the World Wide Fund for Nature's Arguments for Protection Project. The PA-

BAT has been used to identify the various values associated with PPAs, including subsistence, economic, cultural and spiritual, environmental services, political, and biodiversity values. Designed to be a collaborative and participatory approach to values assessment, the PA-BAT has proven effective at distinguishing between the held values of stakeholders (e.g., park managers, subsistence harvesters, local businesses).

2.4. Impact of Protected Areas on Boundary Communities

Protected areas can provide many benefits, however there are also costs associated with establishment and presence of protected areas. These impacts are not only for those within the region or country of the protected area, but certain impacts can be valued globally. In fact, the costs of protected areas have been found to disproportionately accrue to communities located on or near the boundary of the protected area (Mackenzie, 2012). Some of the most negative impacts experienced by local communities include their eviction and loss of access to resources (Mackenzie, 2012).

A significant amount of Indigenous traditional lands occur in protected areas around the world (Stevens, 2014). Lands historically and currently considered Indigenous territories have been found to contain ecologically intact areas, as well as areas of high biodiversity (Stevens, 2014). These characteristics make Indigenous territories desirable for conservation and achieving protection goals. The establishment of parks and protected areas in Indigenous territories has resulted in their displacement from lands, loss of self-governance, restricted or eliminated access to livelihood resources, and barriers preventing continued cultural practices and social relationships (Stevens, 2014).

The displacement and treatment of local communities, including Indigenous peoples, during the establishment of PPA's was, and continues to be, driven and influenced by the core beliefs of 'old paradigm' conservation (Stevens, 2014). 'Old paradigm' conservation includes 'fortress conservation', which is the idea that conservation goals are best achieved through the exclusion of people from wilderness areas (Stevens, 2014, 36). While not instituted universally, this old protection paradigm had a strong influence on parks and protected area policy and practices in many countries. The beliefs of this 'old paradigm' are grounded in four assumptions: state governance and control of protected areas, goals of biodiversity and nature preservation, effective management that means there should be no presence of humans or use of the resources

within the area, and force can and should be used if necessary to remove peoples and protect the biodiversity (Stevens, 2014).

The impacts of protected areas on local populations have been considered around the world. Mackenzie (2012) examined the spatial distribution of impacts from Kibale National Park, Uganda, on 25 boundary villages. A combination of focus groups, interviews, and surveys were used to understand the benefits and losses of the villages in relation to Kibale National Park (Mackenzie, 2012). Sources of losses in the villages included crop raiding, fines for trespass, and increased incidence of poaching (Mackenzie, 2012). Benefits were park-based employment, revenue sharing, initiation and development of locally focused non-governmental organizations, and resource access agreements (Mackenzie, 2012). Their analysis also found that the villages located within half a kilometer of the park boundary accrued the greatest losses, but that villages as far as 15km from the park boundary accrued a greater range of benefits (Mackenzie, 2012).

Miranda et al. (2016) examined whether protected areas in the Peruvian Amazon could both reduce forest cover change and improve the socio-economic situation of local communities. Remote sensing data were used to measure forest cover change and degradation, and household level data collected by the Peru government were used for socio-economic indicators (Miranda et al., 2016). Peru is home to approximately "11 national protected areas and 70 regional or private protected areas" (Miranda et al., 2016, 290). Using matching methods, where a counterfactual scenario was generated that allowed for estimation of outcomes in areas of study if they did not have protected status, it was found that protected areas were effective in reducing loss in forest cover, but had no significant effect on economic well-being of local communities (Miranda et al., 2016).

Reimann et al. (2011) examined the impact of tourism on the boundary communities of five national parks in Estonia. They found that while community members believed that access to the park should be controlled by park authorities, they also found some park policies over-restrictive, particularly in limiting local access to subsistence resources (Reimann et al., 2011). However, the majority of respondents indicated that tourism can be beneficial for communities so long as their presence is not overly disruptive to local livelihoods and traditions.

In Peru, Caruso (2014) investigated the use of co-management of communal reserves between the state and Indigenous peoples. The Ashaninka Communal Reserve (ASCR) was

created in 2003, after years of conflict between different stakeholder groups (Caruso, 2014). The Indigenous communities bordering ASCR were not excluded from the decision process, but their involvement was limited in scope and effectiveness. This was evidenced by the fact that in 2007, it was found that many Ashaninka people near ASCR had no knowledge of ASCR (Caruso, 2014). Caruso found that the narratives about ASCR from the Peruvian state and the Ashaninka peoples were very different. The narrative of state managers indicates that they view the Indigenous peoples as not good managers as they are not conservationists, or are focused on economic benefits (Caruso, 2014). They viewed the establishment of ASCR as a way to intervene and create a presence in this area (Caruso, 2014). However, the Ashaninka people have chosen to work against state involvement in Ashaninka lands by both using the resources of the land as if state is irrelevant and by joining the administrative apparatus of the state to gain control from within (Caruso, 2014).

The Honduran Rio Plantano Biosphere Reserve (RPBR) appeared to represent a move from fortress conservation to conservation which included human presence within protected areas (Mollet, 2014). The reserve is divided into zones, which determine whether human activity is permitted in the area or not. While human activity is allowed in certain zones of the reserve conflicts have still occurred access and control of land and resources, specifically between two different cultural groups, the Miskito and ladino colonos (Mollet, 2014). The Cadastral and Land Regulation Project which occurred within RPBR has had impacts on the Indigenous peoples of the area as it requires individualization of collective family land, which goes against historical, cultural land tenure arrangements (Mollet, 2014). It specifically impacted Miskito women, as it removed their ability to "actively contest their invisibility as farmers and to claim long-standing rights to family lands" (Mollet, 2014, 200).

Thornton (2010) focused on the relationship between Southeast Alaska Natives and National parks in their region. The Tlingit people of Southeast Alaska have had limited historical success in being able to co-manage natural resources in National parks, despite continued resistance of their removal from parks, and regulation and representation by the Park service (Thorton, 2010). Thorton (2010) proposes that this lack of success is a result of conflicting visions of what these natural resources represent, and that conflicts could be reduced by a new conception of resources of cultural significance. While many parks in Alaska provide subsistence

rights to local people for the harvest of resources, the three National parks in Southeast Alaska are considered "Old Parks", as they were established prior to the installation of the subsistence provisions, and therefore, are restricted from subsistence activities (Thornton 2010). The prevention of harvest of natural resources has cultural and relational implications for the Tlingit people. The steward status, and access, of the Tlingit people in Southeast Alaska to natural resources in National parks may be restored through the logic of repatriation (Thornton 2010).

The impact of protected areas on boundary communities has also been analyzed in areas around marine protected areas. Klein et al. (2008) conducted an analysis of conservation and socioeconomic interests of stakeholder groups of marine protected areas in California, along the central coast. This study considered consumptive and non-consumptive interests of stakeholders including "fishers, scuba divers, conservationists, managers, scientists", in the design of marine protected areas (Klein et al., 2008, 692). Different scenarios of marine protected area established were analyzed for impacts to different conservation and socio-economic factors. In the scenario where only biodiversity conservation goals were considered (scenario 1), resulted in a loss of 31.7 percent of fishing effort for commercial and recreational stakeholders, where scenarios which considered the interests of stakeholders resulted in a loss of 10 percent of fishing effort (Klein et al., 2008). Marine protected areas that do not take into consideration socioeconomic impacts on stakeholders are "likely to fail because of lack of community support" (Klein et al., 2008, 698).

Table 2-2: Summary of literature review of impacts of protected areas on local communities (adapted from Klein et al., 2008; Thorton, 2010; Mollet, 2014; Caruso, 2014; Reimann et al., 2011; Miranda et al., 2011; and Mackenzie, 2012)

Study Area	Study Year	Impacts
Kibale National Park, Uganda	2012	Negative impacts were mostly experienced by communities within 0.5km of park boundaries, while benefits accrued to communities as far as 15km away
Peruvian Amazon	2016	Protected areas in the area were shown to reduce forest cover change, but did not impact the

		economic well-being of local communities
National Parks in Estonia	2011	Restriction of local access to subsistence resources, indicators that tourism can benefit local communities
Ashaninka Communal Reserve, Peru	2014	Minimal inclusion of local peoples in decision making process, involvement of local people in State administrative positions in attempt to gain control of decision making
Rio Plantano Biosphere Reserve, Honduras	2014	Individualization of collective family land, removed ability to claim family lands
Southeast Alaska's National Parks	2010	Restriction of access to natural resources which impacts cultural practices and relationships of Tlingit peoples'
California Central Coast Marine Protected Areas	2008	Areas which solely consider biodiversity conservation goals resulted in larger impacts on loss of fishing effort for local stakeholders

Despite such strict state management and enforcement of these areas, and the exclusion and displacement of local communities, including Indigenous peoples', many protected areas have also failed to meet their conservation goals (Stevens, 2014). Despite acknowledgment that the old paradigm of conservation may not be as effective as originally believed, many areas continue to be created or managed without input or consent of Indigenous peoples. However, a new paradigm of parks and protected area theory is emerging (Stevens, 2014).

The international dialogue about conservation policy is changing, and the importance of Indigenous peoples' knowledge and practices have been internationally recognized, along with the affirmation of their rights to be involved and consulted in development and management of parks and protected areas (Stevens, 2014). This transition to the 'new paradigm' of conservation is being supported and developed by the International Union for Conservation of Nature (IUCN) and the Parties to the Convention on Biological Diversity (CBD) (Stevens, 2014). Stevens (2014, 7) summarizes the 'new paradigm' of conservation as:

> "It maintains that biodiversity conservation can be advanced by recognizing, respecting, and supporting Indigenous peoples' conservation achievements and initiatives and by working together with them in ways that respect their ownership of territory, their sovereignty, and their rights and responsibilities."

In 2003 the Durban World Park Congress marked an important moment in Indigenous rights and protected areas as it was the first World Park Congress attended by a large group of Indigenous people (Stevens, 2014). This meeting became the start point for conversations between conservationists and Indigenous peoples and identified the 'new protected area paradigm'. This new paradigm became a part of IUCN policy and advocacy, leading to a change in CBD policy as well. Durban provided a place for Indigenous peoples to "condemn past practices and to challenge the IUCN to require that protected areas recognize and respect Indigenous peoples' rights, responsibilities, and conservation contributions (Stevens, 2014), specifically in the *Indigenous Peoples' Declaration to the World Parks Congress*.

Rather than calling for the elimination of protected areas that had violated Indigenous peoples' rights, they advocated for the reform of protected areas, to change the vision and underlying assumptions of conservation (Stevens, 2014). While not without controversy, the statements and discussion eventually led to a set of policy recommendations from the IUCN that state respect is required for Indigenous peoples' rights, knowledge, and past contributions, as well as that management of protected areas located in Indigenous territories must include effective and full participation of those Indigenous peoples' (Stevens, 2014).

This new paradigm, while specifically designed to account for rights and knowledge on Indigenous communities in or near protected areas, could also take into consideration all boundary communities of protected areas, in areas where boundary communities are not Indigenous peoples. This has implications for protected area management as managers are

required to balance the many benefits and costs of protected areas, but also the distribution of these impacts. For the new paradigm to be seen in practice in the governance of PPAs, it will be important for methods to be developed to quantify, or understand, the benefits and costs of PPAs to boundary and Indigenous communities. New paradigm governance will require greater understanding of the magnitude of PPAs impacts, and the distribution of these impacts across geographic regions and stakeholders.

2.5. Northern Protected Areas

The circumpolar Arctic refers to the areas of the north covered in continuous and discontinuous permafrost (Conservation of Arctic Flora and Fauna (CAFF), 1996). The characteristics of the Arctic make it unique, and lend to its' global value. The Arctic environment is one of the harshest environments known, making its native species unique, and these ecosystems are also sensitive and vulnerable to stresses and changes (CAFF, 1996). It is also hosts large scale migrations of Arctic species, and remains a relatively intact undisturbed natural area (CAFF, 1996, 11). Not only is the Arctic home to unique ecological systems, the Arctic is also home to significant populations of Indigenous peoples (CAFF, 1996). This area includes the lands of eight countries: Canada, Finland, Denmark, Iceland, Norway, Russia, Sweden, and the United States (CAFF, 1996). These countries are also members of the Circumpolar Protected Areas Network.

The Circumpolar Protected Area Network (CPAN) was developed as part of the Arctic countries commitments as signatories of the 1992 Convention on Biological Diversity (Conservation of Arctic Flora and Fauna Program (CAFF), 2002). Protected areas included in the CPAN are classified using the IUCN management categories, and in management the rights and traditional uses of indigenous people must be accounted for (CAFF, 1996). The use of formal protected area status is a tool Arctic countries have found to be effective in conservation efforts. In the management of these protected areas many countries attempt to find a balance between conservation and the rights of Indigenous and local peoples (CAFF, 1996). When the CPAN began in 1996 there were 285 IUCN categorized protected areas in the Arctic. The CPAN program became dormant in 2010 (CAFF, 1996).

The Conservation of Arctic Flora and Fauna Program (CAFF, 2002) produced a summary of values provided by protected areas in the Arctic. The program found that some of the values

Arctic protected areas provide include: protection of freshwater deposits, protection of wildlife and prevention of species extinction, ecological, subsistence and scientific values of Arctic vegetation, physical and biological values of forests, aesthetic and scenic values, contribution of global knowledge on climate change, preservation of heritage, traditional cultures, and generating economic benefits for northern residents (CAFF, 2002).

The Arctic has been increasingly exposed to development since the late 20th century, including resource extraction development, and tourism and transportation infrastructure (Koivurova, 2009). While development pressures increase, conservation efforts have not been neglected. In 2004 almost 20 percent of the Arctic was designated as protected areas based on IUCN categories, while the global conservation average is just over 11 percent (Koivurova, 2009).

In 2007, Thompson and Peepre conducted an assessment of the economic benefits of completing the protected area network in Northwest Canada. Using an examination of economic trends including visitor spending, government spending and revenue, and job creation the researchers identify three primary benefits of protected area network completion. These benefits are: provision of regional economic development opportunities where the benefits may remain in the local region, diversifying the economics of resource development dependent northern communities, and the protection of tourism assets (Thompson & Peepre, 2007).

Traditional ecological knowledge (TEK) is a body of knowledge accumulated by indigenous peoples. Many indigenous peoples around the world view the entire environment as interrelated, and see everything as connected through relationships, including the connection of human beings to nature. TEK encompasses applying the knowledge gathered about these relationship (Watson et al., 2003). While in some areas of the circumpolar north a more holistic approach to management of wilderness areas has developed, there are several factors Watson et al. (2003) identify as threats to the inclusion and protection of TEK, which wilderness protection may alleviate. Some of these factors are "political conflict…, globalization, energy exploration and development, heavy industry development, fragmentation of ecosystems …, and other illegal violations (Watson et al., 2003, 4).

Watson et al. (2003) examined the relationship between Traditional Ecological Knowledge and wilderness protection in the circumpolar north. The United States, Finland,

Canada, and Russia all have some form of legislatively protected and defined wilderness areas. Recent legislation in Iceland has allowed for protection of wilderness areas, however in Sweden, Norway, and Greenland there are no legally defined wilderness areas that are protected (Watson et al., 2003). They found that "very little research has been conducted on the interaction between subsistence uses and other wilderness uses" (Watson et al., 2003, 2). It is still important to understand how indigenous activities are related to wilderness designations, and the cultural importance of these activities, especially how traditional ecological knowledge influence wilderness management (Watson et al., 2003).

Brown et al., (2015) examined the link between cultural values, cultural ecosystem services, and management preferences in protected areas in Norway and Poland. This research used public participatory GIS methods to "identify ecosystem values and management preferences associated with protected areas" in the two countries (Brown et al., 2015b, 89). Study participants in both countries listed enjoying nature, experiencing solitude, and recreational activities as reasons for visiting protected areas (Brown et al., 2015b). Harvesting of resources was also listed as an important reason for visiting protected areas by participants in Norway. In response to satisfaction about protected area management the majority of Norway respondents stated there should be more local knowledge included in management. They were also more satisfied than dissatisfied with local management boards (Brown et al., 2015b). Finally, the study examined geographic groupings of protected area values, in Saltfjellet national park in Norway. Study participants grouped resource use values (hunting, fishing, gathering) along with cultural and nature values in certain areas, demonstrating the connections between different types of values in protected areas (Brown et al., 2015b).

Protected areas in the north have been found to "fit well with northern life styles, quality of life expectations, the desire to pursue subsistence harvest of wild species, and opportunities for community development" (Thompson & Peepre, 2007, 3). As well as being suited to be included in the mixed-economies of many northern communities (Thompson & Peepre, 2007). The ability to identify and quantify the wide range of values, including economic benefits, that these protected areas can provide to northern communities will provide better information for management decisions and additions to protected area networks.

2.5.1. Protected Areas in Alaska

In 1970 the Division of Parks was created in the Alaska State Government, along with the first three State Parks (DeVaughn, 2010). As of 2010, the Alaska state park system contained over 120 park units (DeVaughn, 2010). While 1970 marked the official beginnings of the Alaska state parks system, sites had been reserved for recreation from 1959 (DeVaughn, 2010). The parks system had the mission of providing recreational opportunities, and conservation of various resources for residents use and enjoyment, leading to the renaming of the Division of Parks, to the Division of Parks and Outdoor Recreation (DeVaughn, 2010). Alaska is also home to 15 national parks, under the management of the National Park Service (National Park Service, 2016).

A significant portion of the national park system in Alaska was established under The Alaska National Interests Land Conservation Act of 1980 (Thornton, 2014). Not only did it allow for the addition of 80 million acres of federal lands in Alaska to receive protection, but the bill also contained a provision for "subsistence uses of wild renewable resources by Alaska's rural residents (Thornton, 2014, 112). However, this bill only included the rights to subsistence for rural residents, and did not apply evenly to all protected areas (Thornton, 2014).

Land ownership and management in Alaska has changed since the U.S. acquired Alaska in 1867 (Hull & Leask, 2000). The Alaska Native Allotment Act 1906 allowed individual Alaska Natives to each acquire up to 160 acres of land (Chinn & Favorite, 2012). In 1959 Alaska became a state, and chose 104 million acres of federal land that had not already been allocated to other purposes (Hull & Leask 2000). Prior to this selection, claims for land allotments from Alaska Native peoples under the Alaska Native Allotment Act 1906 had been growing, but had not yet been settled. The state land selection posed an immediate threat to the traditional lands of Alaska Natives (Hull & Leask 2000, 2). At the end of the 1960s the large number of native claims for land allotments prompted a halt of all land transfers until the land claims were resolved (Hull & Leask, 2000, 3).

The Alaska Native Claims Settlement Act, which repealed the 1906 Alaska Native Allotment Act, was passed in 1971 (Chinn & Favorite 2012). The settling of land claims resulted in payments of over US$ 1 billion, and a grant of 44 million acres (Hull & Leask, 2000). This act also granted management responsibility for lands and money to village and regional

corporations, as well as allocating 80 million acres for potential inclusion in conservation units (Hull & Leask, 2000). However, as some allotments remained from the 1906 act, some lands were selected by more than one entity during this land transfer process, leading to disputes and delays. In an attempt to find a resolution for land claims, the Alaska Land Transfer Acceleration Act was passed in 2004. As of 2012, 96 percent of land entitlements for native allotments and state lands had been transferred (Chinn & Favorite, 2012).

In 1980, the Alaska National Interest Land Conservation Act was passed and another 160 million acres were set aside for conservation protection. However, this act created management disputes which continue to this day (Hull & Leask, 2000). As select private lands, including native settlement allocations, occurred prior to establishment of some conservation units, small parcels of land are under private ownership within larger conservation boundaries (Hull &Leask, 2000). As of the year 2000, distribution of land ownership in Alaska included 150.50 million acres to national parks, refuges, and forests, 3.3 million acres to state parks, and 37.40 million acres of Alaska Native Corporation lands (Hull & Leask, 2000).

Thornton (2014) examined the success of Indigenous peoples' in Southeastern Alaska in gaining control over cultural and natural resources component of the U.S. national park system. The historical and cultural context in which national parks were developed in Alaska led to park landscapes being protected like fortresses, and being preserved as part of a national identity reflected through the preservation of historical landscapes. This emphasized excluding other identities from association with national parks, including the Indigenous peoples of Alaska (Thornton, 2014). The Tlingit, an Indigenous people of southeast Alaska, have resisted the dominant identity proposed by the national park system, and have recently been able to promote their own identity, and history within three national parks in southeastern Alaska (Thornton, 2014). Repatriation of cultural items, while a long involved process, has resulted in the return of many sacred and cultural items to the Tlingit as well as other Indigenous peoples' of the U.S. The logic of repatriation has allowed the Tlingit people to attempt to gain access to food resources, which are part of authentic Tlingit foods that are viewed as sacred possessions and ceremonial offerings (Thornton, 2014). In Klondike Gold Rush National Historical Park, the Tlingit are striving to change the representations of historical events that took place, specifically the Chilkoot Trail. Steps have already been taken to start this process. Alaska Natives have

begun to argue that the history of the trail did not start with the gold rush, and they have also begun to map the landscape to account for their history (Thornton, 2014). Sitka National Historical Park, and Glacier Bay National Park have also served as places where repatriation and the starts of reconciliation can take place between the government and the Tlingit peoples. Repatriation is being used in national parks in Alaska to begin to restore the status of Indigenous peoples as caretakers of the land (Thornton, 2014). Encouraging steps have been taken, and Thornton (2014) proposes that continued application of repatriation principles may allow for the new paradigm of conservation to take hold.

Protected areas also contribute to the Alaska economy. Colt and Fay (2014) conducted an analysis of available data to determine the value of wilderness to the Alaska economy, primarily considering tourism by non-residents, and resident recreation and subsistence harvest. The majority of tourism activity in Alaska takes place in Alaska's national parks, with more than half of tourism expenditures coming from Denali National Park (Colt & Fay, 2014). In 2001, a Visitor Opinion Survey was conducted as part of the Alaska Visitors Statistics Program that included specific questions about wilderness (Colt & Fay, 2014). This survey revealed that Alaska's wilderness, and the opportunity to spend time in wilderness, influenced over 80 percent of survey respondent's decisions to come to Alaska. For 73 percent of respondents wilderness was important for planning to visit Alaska again (Colt & Fay, 2014). Eighty percent of respondents also were in favour of "rationing the use of popular wilderness areas to protect the natural environment" (Colt & Fay, 2014).

While wilderness is a draw for visitors, the remoteness of State, and National parks in Alaska influences visitor access, many have almost unlimited points of entry, not a single access point, which makes estimating visitor impacts difficult (Fay & Christensen 2012). Fay and Christensen (2012) conducted a case study on improving visitor impact assessments for remote public lands using Katmai National Park and Preserve. To account for the unique Alaskan rural economy the impact model used direct estimates from IMPLAN software, which increased the cost and complexity of the analysis (Fay & Christensen 2012). The results found that in 2007, Katmai National Park and Preserve contributed US$50 million in visitor spending, supported 647 jobs which provided US$23 million in labour income (Fay & Christensen, 2012).

Goldsmith et al. (1998) completed an economic assessment of the national wildlife refuges located in the Bristol Bay area of Alaska. The national wildlife refuges in this area are Alaska Peninsula/Bercarof, Izembek, and Togiak, of which the eastern boundary is Wood-Tikchik State Park (Goldsmith et al., 1998). This research involved an economic significance analysis, and a net economic value analysis. The economic significance measures the employment and household income generated by activities in the Bristol Bay national wildlife refuges (Goldsmith et al., 1998). In 1997, these authors estimated the national refuges in Bristol Bay supported annual employment of 3,225 jobs, and activities that led to total personal income of US$126.8 million (Goldsmith et al., 1998). An estimate of annual total economic value was also measured. The net economic value measurement included "onsite recreational activity, commercial use of refuge resources, subsistence use of refuge resources, the value of species preservation, and existence values (Goldsmith et al., 1998, 6-1). Annual net economic value is the willingness to pay of the United States for the benefits the refuges provide, and is calculated by total economic value less costs of benefit provision (Goldsmith et al., 1998). This measure was calculated for both use and non-use values of the three Bristol Bay refuges. Goldsmith et al. (1998) found the net economic value of use of the refuges to be US$82 million, and the net economic value of non-use values to be between US$2.3 and $4.6 billion.

Much of the research into the value and economic benefits of protected areas in Alaska has involved areas under national management. The location and funding of national parks and wilderness areas allow for assessments to be more easily conducted. This research has also primarily considered direct economic values, through market transactions, excluding other values protected areas can provide. However, the benefits of state protected areas in more remote locations are still important for management and policy decisions.

2.6. Summary

Protected areas, which continue to be a contested approach to conservation because of past experiences of displacement and conflict, can provide many benefits through ecosystem services aside from achieving biodiversity goals. Management of protected areas that has focused on conservation only while ignoring the impacts on local populations can create displacement and conflict, but a new paradigm of conservation is emerging which would see rights and values of Indigenous peoples, acknowledged in protected areas, which has

implications for the distribution of benefits and all boundary communities. The challenge in including all benefits in management decisions is determining representative values for those benefits so decisions can be evaluated.

There is a variety of methods currently being used to understand the value of ecosystem services. However, these disciplinary approaches tend to be suited to certain bundles of ecosystem services, rather than being able to address all ecosystem services with one method. Therefore, complex assessments are needed to understand the values of any protected area.

Protected area managers are challenged with the task of making decisions which may contain conflicting values between stakeholder groups. The range of benefits protected areas can provide have been found to be well suited for the mixed economies and cultures in the north. There is a continued need for holistic value assessments of protected areas in the north to understand the benefits to different stakeholder groups.

Chapter one and two have presented the introductory material for the research conducted in this thesis, including overall context and objectives for the research conducted through this thesis, as well as a review of literature that served as the basis for the analysis. Chapter three and four will present the research site background, a detailed methodology, results, and discussion for the research conducted in this thesis. Chapter five will be a discussion of results, study limitations, areas of further research, and policy implications of this research.

Chapter 3.

Research Site and Methodology

3.1. Introduction

Chapter three includes information about the research site in this study, including information about Wood Tikchik State Park (WTSP), management characteristics, and activities. Following the research site information, a detailed description of the methodology employed in this study will be presented. The methodology described includes three separate approaches employed: secondary data analysis, survey of WTSP visitors, and key informant interviews.

3.2. Research Site

Wood-Tikchik State Park (WTSP) is located north of the city of Dillingham, in the Bristol Bay region of southwest Alaska (Figure 3-1). WTSP was named after the region's major drainage system – the Wood River and Tikchik Lake. The geological make-up of WTSP is quite diverse, with 12 lakes over 1,000 acres, rivers up to 60 miles in length, mountains that exceed 5,000 feet in elevation, and extensive lowlands areas (ADNR DPOR, 2002). Encompassing 1.6 million acres, WTSP encompasses nearly half of the State Park land in Alaska, and is the largest of the 10,234 state parks in the entire United States (ADNR DPOR, 2015a).

Figure 3-1: Map of location of WTSP, and local commercial fishing districts (Nushgak Bay and Kvichak Bay) (Bristol Bay Heritage Land Trust, 2012a).

The primary purpose for establishing WTSP was to conserve the area's vast fish and wildlife resources, while supporting subsistence and recreational activities. The management philosophy is therefore, "one of non-development and protection of the area's wilderness character" (ADNR DPOR, 2015a). The execution of this philosophy is the responsibility of the WTSP Management Council. The council consists of seven members who represent the village/city councils of Koliganek, New Stuyahok, Dillingham and Aleknagik, the Bristol Bay Native Association (Tribal Consortium, non-profit corporation, which represents 31 tribes in the Bristol Bay region) , and the Alaska Departments of Natural Resources and Fish and Game (ADNR DPOR, 2002). The primary responsibilities of the council are to review and decide upon various land use requests and designations and to liaison with regional communities and state and Native organizations. The WTSP Management Plan identifies eight communities located in the vicinity of WTSP whose residents access WTSP (ADNR DPOR, 2002). These communities are considered the boundary communities of WTSP. With a total population of 3,961, these communities include: Aleknagik (pop. 219), Dillingham (pop. 2329), Ekwok (pop. 115), Koliganek (pop. 209), Manokotak (pop. 442), New Stuyahok (pop. 510), Platinum (pop. 61),

Portage Creek (pop. 2), and Twin Hills (pop. 74) (State of Alaska 2010 Census) (Figure 3-2). Much of the population that resides in these communities are central Yupik, who have lived in the region for an estimated 2,000 years (Dubinina and Crowell. 1996). Today, both Yupik and non-Native Alaskans live in the region where they carry out aspects of subsistence living and benefit from the resources found in and around WTSP.

Figure 3-2: Local Communities around Wood-Tikchik State Park, Alaska (ADNR DPOR, 2015b)

Subsistence activities are an important component of the lifestyles of boundary community residents. The subsistence lifestyle provides physical and cultural connections for Alaska Natives (Loring and Gerlach, 2009). Subsistence activities continue to be important in rural Alaskan communities, as procurement of food is made difficult by transportation costs of commercial food products, employment opportunities, and lack of infrastructure. Increasing the importance of subsistence harvested products to members of these rural communities (Loring and Gerlach, 2009). WTSP supports several activities including trapping, hunting of moose, picking berries, and gathering of other resources for food and handicrafts (ADNR DPOR, 2002). However, the most important resource, in terms of commercial and subsistence value, is salmon. There are five species of salmon that use WTSP during their lifecycle: chinook (*Oncorhynchus tshawytscha*), sockeye (*Oncorhyncus nerka*), Coho *(Oncorhyncus kisutch*), pink (*Oncorhynchus gorbuscha*), and chum (*Oncorhynchus keta*). As well, there are multiple species of freshwater fish including Dolly Varden (*Salvelinus malma*), Arctic Char (*Salvelinus alpinus*), grayling (*Thymallus thymallus*), and rainbow (*Oncorhynchus mykiss*) and lake trout (*Salvelinus namaycush*) (ADNR DPOR, 2002, 3-3).

Providing half of the world's sockeye salmon, the Bristol Bay salmon fishery is estimated to be worth $1.5 billion in annual output and sales (Knapp et al., 2013). In the 2010 commercial fishery season, 29 million sockeye salmon were harvested in Bristol Bay, and the summer sockeye season supported 12,000 jobs in both fishing and processing (Knapp et al., 2013). The Bristol Bay sockeye salmon run is the world's largest, and the commercial fishing industry provides one third of Alaska's earnings from salmon harvest, and supports almost 75 percent of local jobs in the region (National Wildlife Federation, 20170). The importance of WTSP for the production of salmon in the Bristol Bay region cannot be overstated. The rivers and lakes serve as critical spawning habitat for returning salmon that support commercial and subsistence needs of communities (United States Environmental Protection Agency, 2012, 4).

A unique characteristic of WTSP is the presence of over 100 private land holdings within the park boundaries (Figure 3-3). Starting in 1891, the US Congress allowed businesses to select up to 160 acres for business operation sites, or five acres for business headquarter sites from federal lands (Hull and Leask, 2000). Certain private properties in WTSP are on lands that were originally designated as trade and manufacturing sites prior to WTSP establishment. These properties retained their commercial designation and private ownership when WTSP was established. The other form of land allotment involves lands owned by Native Corporations and individuals, which are certified under the Native Allotment Act. Native allotments and other private lands occupy just over 6,000 acres of the almost 1.6 million acre WTSP (Table 3-1). The 101 parcels of land allocated by Native allotments are owned by individuals, either those who were originally granted ownership of the land, or those who purchased land from another owner. These allotments are of particular significance for the rights and livelihoods of Alaska Natives because of the Alaska Native Claims Settlement Act (ANCSA) of 1971, which extinguished aboriginal title and continues to create a historical legacy of vulnerability and insecurity for Alaska Natives throughout the state (Gerlach et al., 2011). These private parcels can be used for any non-commercial purpose the owner desires, such as camping, a base for hunting or fishing, or cabin locations. Other lands within WTSP not owned by the Alaskan State include the lands owned by Aleknagik Natives Limited, which is currently being preserved through a conservation easement, in agreement with Alaska State Parks and the Bristol Bay Land Trust (Bristol Bay Heritage Land Trust, 2012b). Development is currently prohibited on this land area.

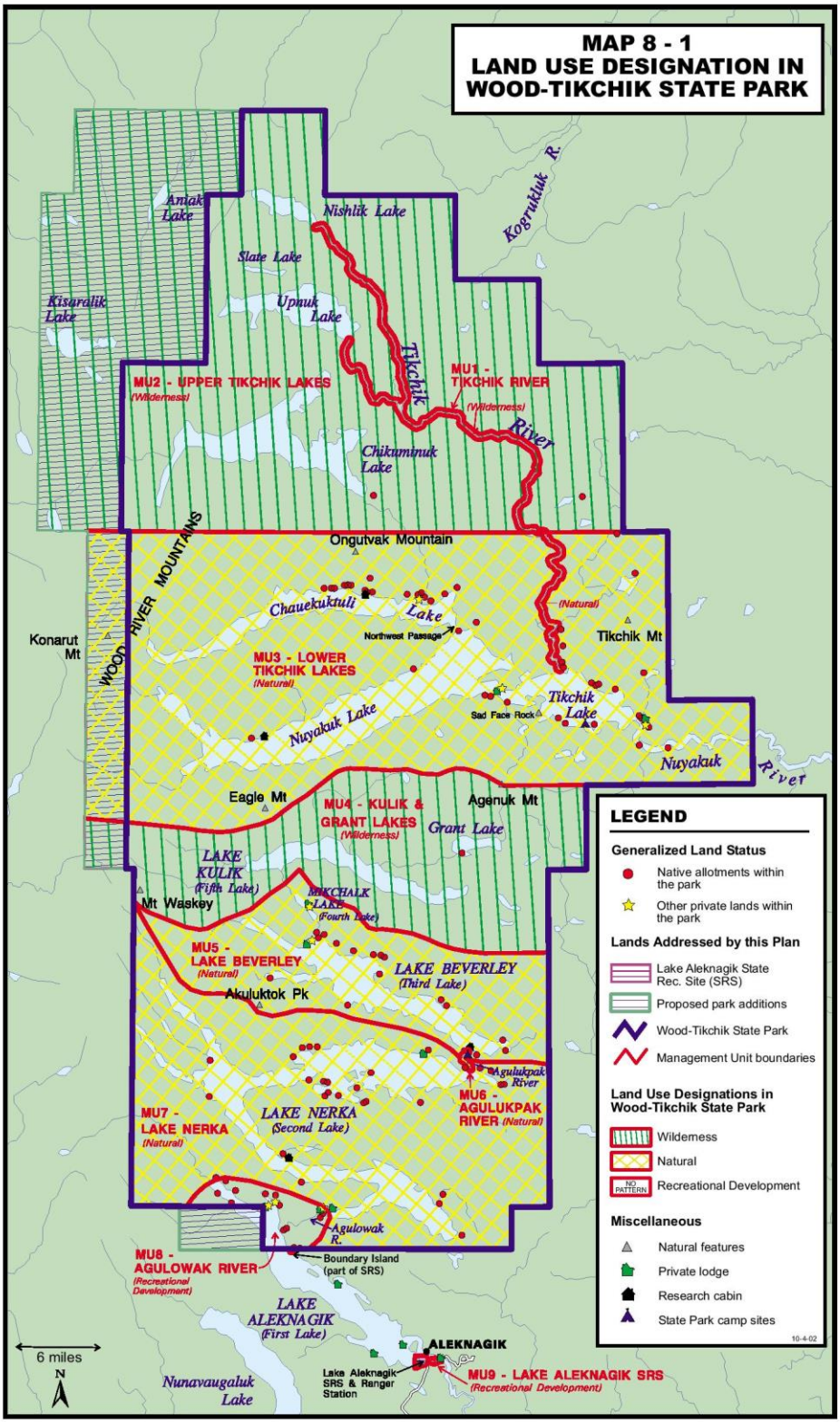

Figure 3-3: Land use designation of Wood-Tikchik State Park (ADNR DPOR 2002. 8-3).

Table 3-1: Ownership of Acreage of Land within the Park Boundaries (adapted from ADNR DPOR, 2002, 2-2)

Ownership	Number of Parcels	Acres (x 1,000)
In all ownerships		1,555
All lands owned by the State		1,521
Owned by Aleknagik Natives Limited		26
State owned, Native selected		4
US Bureau of Land Management owned, Native selected		2
Native allotments	101	6
Other private lands	9	0.074

When WTSP was proposed as an addition to the Alaska State Park system, it was identified as an area of significant recreational opportunity. The planned Wood-Tikchik State Park included the development of campgrounds, lodges, hiking trails, food service, boat rentals, air and water taxis, and a visitor center (Department of Natural Resources Division of Parks, 1974). The annual economic impact of the proposed WTSP by 1980 was expected to be US$1,600,000, with an estimated 10,000 visitor days at fishing lodges at an average cost of $150/day, and 10,000 visitor days for campers who would spend an estimated $10/day, not including any costs of transportation to the park (Department of Natural Resources Division of Parks, 1974). The facilities and services were intended to be developed over five phases, with a total development and employment cost of $778,000 (1973 USD) (Department of Natural Resources Division of Parks, 1974). Despite expectations, WTSP has been marginally developed with minimal recreation and commercial investment. Today, the 1.6 million acres of WTSP are managed by a single park ranger, whose responsibilities range from maintenance of state recreation sites and other park facilities to enforcement of park regulations (ADNR DPOR, 2002).

The Bristol Bay Region of Alaska is currently the center of a discussion around development in the presence of environmental risks. The Northern Dynasty Minerals Ltd. Pebble Project is a development project to mine a copper, gold, molybdenum, and silver deposit in the Bristol Bay Region (The Pebble Partnership, 2016a). The pebble deposit is located approximately 200 miles by air from Anchorage, and the closest community is Nondalton (Figure 3-4) (The Pebble Partnership, 2016b). Aleknagik and the entrance for WTSP are about 140 miles from Nondalton. Acccorrding to The Pebble Partnership (2016c), the proposed mine is

expected to bring 1000 full-time jobs into the region for the first 25 years of production, as well as many construction jobs during mine development. However, it is questioned how many of those jobs will be filled by local residents, and the mine is also thought to put at risk the jobs of thousands of local residents who work in the recreational and commercial fishing industries in the Bristol Bay region (Trout Unlimited, 2017).

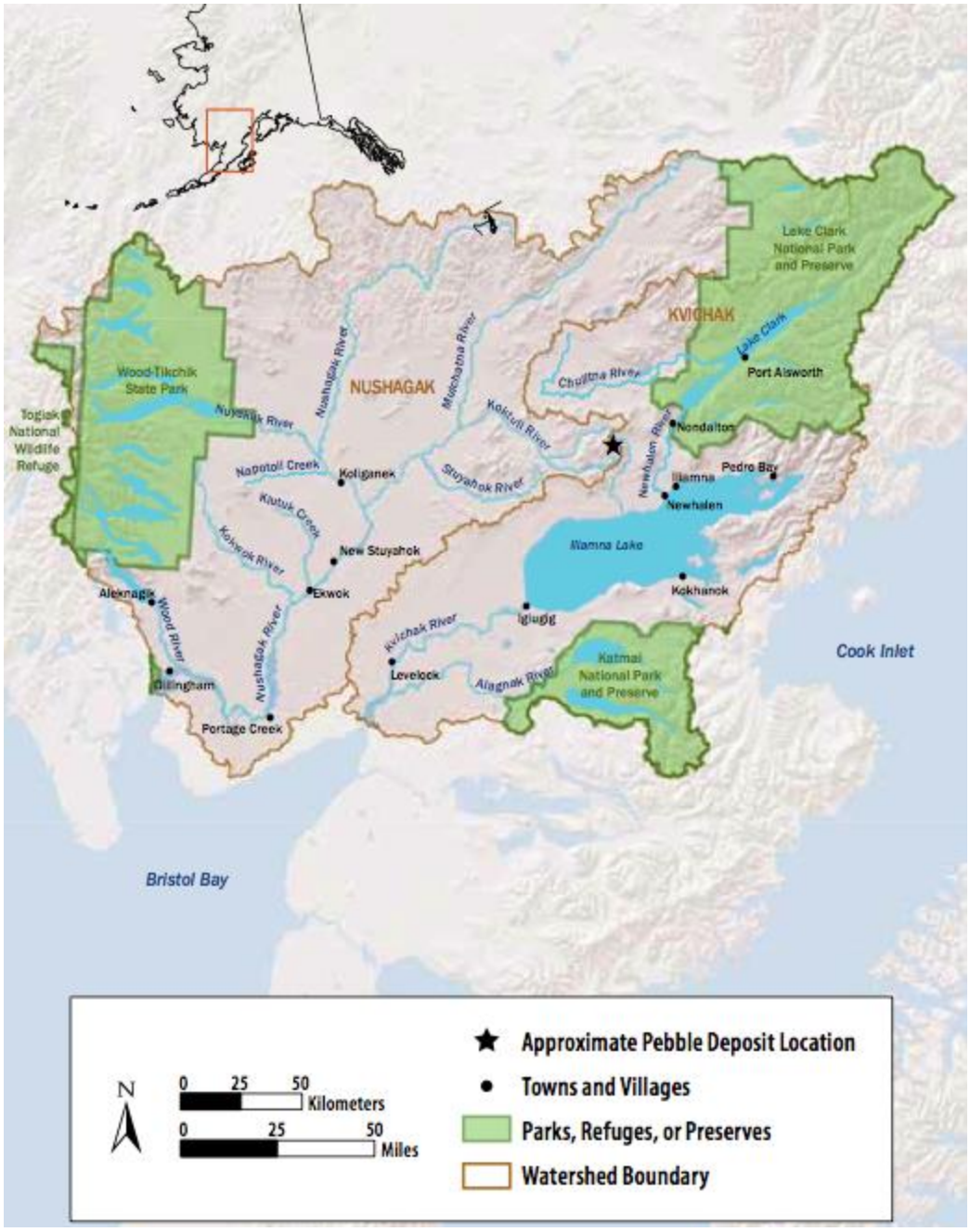

Figure 3-4: The Nushagak and Kvichak River Watersheds of Bristol Bay (United States Environmental Protected Agency, 2014, 2)

The United States Environmental Protection Agency (2014) conducted an assessment of the risks to salmon ecosystems in the region due to mining development, as the pebble deposit is located at the headwaters of tributaries that ultimately flow into Bristol Bay, through the Nushagak and Kvichak river watersheds (United States Environmental Protected Agency (US EPA), 2014, 4). Three different scenarios of potential mining development were assessed, and it was found that all scenarios produced multiple stressors that would affect the Bristol Bay watershed's fish, and welfare (US EPA, 2014, 12). Some of these stressors were loss of streams, alterations of stream flow, loss of wetlands, degraded habitat, wastewater leakage, water treatment failure, and multiple mining system failure scenarios (US EPA, 2014, 14-25).

3.3. Methodology

The purpose of this research was to analyze the distribution of benefits of WTSP across stakeholder groups, using both monetary and non-monetary valuation. This analysis primarily focused on direct and indirect use benefits of WTSP, including: harvest of resources, tourism and recreation, environmental services, and social/cultural benefits. Identified stakeholders of WTSP included in the analysis are owners of land within WTSP, boundary community residents, government, non-governmental organizations, and commercial industries. This analysis was completed using data collected from secondary sources, supported by primary data gathered through key informant interviews and surveys.

3.3.1. Identification of Direct Use Benefits and Secondary Data Analysis

The specific benefits provided by WTSP that were categorized as direct use were determined through consultation with park management, and review of available literature on WTSP. We focused on the benefits of such activities as commercial and subsistence salmon harvest, tourism through fishing lodges, and other commercial recreational use of the park. The monetary values of direct use benefits were calculated based on commercial and subsistence salmon harvest records, estimated tourism revenue for fishing lodge owners, and Alaska State Park records on park visitation for commercial recreational activities.

Estimates of the value of commercial sockeye salmon harvest benefits were based on annual management reports published by the Alaska Department of Fish and Game, which contain detailed information on the commercial sockeye salmon harvest. In these reports, data on the quantity and monetary value of annual harvest, as well as the percentage of commercial

harvest permits owned by Alaskan residents are collected and published. The three most recent years of data available (2013-2015) were used in this analysis.

The subsistence harvest information was accessed from the Community Subsistence Information System (CSIS). Information gathering is conducted by the Alaska Department of Fish and Game (ADFG) in different communities throughout the state each year. Reported results include percentage of community residents attempting to harvest for subsistence purposes, species harvested, and estimated amounts of harvest (Alaska Department of Fish and Game, 2017c). Estimates of subsistence harvest of sockeye salmon from four WTSP boundary communities were collected by ADFG between 2005 and 2010. The estimated total weight of salmon harvested for the four available communities was considered a minimum estimate for the annual economic value of subsistence salmon harvest for the WTSP boundary communities, as these communities do not represent the total population of local residents which harvest from WTSP. The ADFG, Division of Subsistence states that the dollar value of each pound of subsistence salmon harvested is estimated to be between US$4 and US$8 (Division of Subsistence, ADFG, 2012). This is the estimated replacement expense per pound of salmon should it need to be purchased from another source. The two most sought after species of salmon for subsistence by the local communities around WTSP are Chinook (Oncorhynchus tshawytscha) and Sockeye (Oncorhynchus nerka).

To determine the contribution of WTSP harvest and habitat to the harvest of salmon in Bristol Bay, escapement estimates were used. Escapement is "the number of fish allowed to escape the fishery and spawn." (Carroll, 2005). Each year, escapement is estimated for seven rivers that feed into Bristol Bay. As the Wood River flows directly from WTSP to Bristol Bay, all escapement in the Wood River can be attributed to WTSP. Salmon return to the same streams where they were born (Western Fisheries Research Centre, 2016), therefore, the percentage of fish returning to WTSP is the best estimate available for the percentage of total salmon that originated from WTSP. Wood River escapement as a percentage of total escapement was estimated, and this percentage was used to estimate the annual value of salmon harvest attributable to WTSP. For commercial salmon harvest, the average annual percentage escapement from 2013-2015 was used, and for subsistence harvest the average annual percentage escapement from 2005-2010 was used. Subsistence harvest data for communities located near

WTSP were only collected from 2005-2010, while the annual commercial harvest is monitored each year.

Using secondary data, the monetary value of commercial recreational visitors to Alaska State Parks, and commercial fishing lodge owners was estimated. The only recreational activity in WTSP currently tracked by Alaska State Parks are recreational visitors who engage the services of a commercial operator in WTSP. This is referred to as commercial visitor activity, and is tracked for all operators who hold commercial permits for WTSP. The annual number of commercial permits issued for WTSP was available for 2011-2014, and 2016. As commercial permit holders are required to pay a fee per person, per day, for use of WTSP to Alaska State Parks, the annual number of visitor days for commercial visitors is collected. The annual number of commercial visitor days is also categorized by activity type. These activities included air and water taxies, sport fishing and hunting guiding, kayak and watercraft tours, guided hiking, and boat rentals. The monetary value of commercial visitor activity to Alaska State Parks was estimated based on the number of visitor days and the per day fee paid to Alaska State Parks. The revenue to owners of commercial sportfish guiding lodges was estimated based on average cost per day of engaging the services of these lodges, using the costs published on their websites in 2016, and the annual number of visitor days allocated to sportfish guiding in 2016.

The approximate geographic distribution of monetary values to stakeholders was then estimated using the available secondary data. Distribution of monetary values from salmon harvest from WTSP was estimated using residence of commercial permit holders and subsistence communities. The distribution of commercial recreation monetary values were estimated based on Alaska State Parks revenue and residence of commercial sportfish guiding lodge owners.

3.3.2. Survey of Visitors to Wood-Tikchik State Park

As one of the major components of direct use benefits of WTSP is recreation and tourism activity, more information was required to understand wider benefits of activity in this sector. While information collected by Alaska State Parks can be used to estimate recreational revenue to Alaska State Parks and commercial lodge owners, information on whether visitors make any expenditures outside of sport fishing lodges was required, as well as the types and residence of visitors which come to WTSP. To supplement the information State Parks collects on park visitation, a survey was administered to park visitors during the summer of 2016. The survey consisted of 11 questions: four demographic questions, three on travel expenditures, and four on

trip characteristics (Appendix A). Questions on travel expenditures included approximate monetary expenditures on travel from permanent place of residence, estimated expenditures in Dillingham, and estimated expenditures in WTSP. Trip characteristics of interest were number of days in WTSP, if WTSP was the primary trip destination, number of trips to WTSP in the last 10 years, and number of individuals in the travel group. As there is no sole primary access point to WTSP, surveys were distributed at one of the fishing lodges located in WTSP. Eleven survey responses were received.

3.3.3. Key Informant Interviews

Key informant interviews were conducted with stakeholders of WTSP to understand the importance of other monetary and non-monetary benefits of WTSP to boundary communities and other stakeholder groups. Insight as to how benefits are provided, and the perceived impacts and benefits for the communities were explored. Key informants were identified as knowledgeable individuals who were representatives of WTSP stakeholder groups. The interviews were semi-structured, with the focus of the questions informed by the Protected-Area Benefits Assessment Tool (PA-BAT). The PA-BAT is an assessment tool used to account for the multiple benefits of PPAs (Stolton and Dudley, 2009). The PA-BAT consists of a series of questions regarding protected area values, where participants are asked to rank, on a scale of importance, the various benefits PPAs provide. Through consultation with the WTSP park ranger, the list of 24 potential benefits included in the PA-BAT was refined to best reflect the values and permitted activities inherent to WTSP. Benefits eliminated from the PA-BAT for this study included benefits non-permitted activities such as agriculture, livestock grazing, and timber harvest, and activities which were not relevant for WTSP, including coastal protection, extraction of materials not covered by other benefits, and pollination of crops, Based on this consultation, the list of 16 benefits included in the key informant interviews, in no particular order, were: (1) Fisheries; (2) Hunting of wild game; (3) Wild food plants; (4) Medicinal resources; (5) Water use; (6) Water quality and quantity; (7) Flood prevention; (8) Cultural and historical values; (9) Sacred natural sites; (10) Recreation and tourism; (11) Wilderness or iconic values; (12) Knowledge building; (13) Education; (14) Genetic material; (15) Climate change mitigation; (16) Nature conservation. All participants were given the opportunity to add additional benefits to this list during the interview, if they felt any were not covered by the 16 benefits listed.

For each of the 16 identified benefits of WTSP, interview participants were asked whether the benefit was of minor, major, or potential importance to their stakeholder group. Dudley and Stolton (2009) define these categories as:

- "Minor: this could either reflect low importance for the stakeholder group or that importance is significant to only a small proportion of the stakeholder group, and thus overall the level of importance is minor.
- Major: this assessment should be made where the benefit is of significance for a large proportion of the stakeholder group.
- Potential: which identifies potential to increase either the subsistence or economic value; and who could benefit from that increase in potential." (Dudley and Stolton, 2009, 15).

Terminology used in the descriptions of values of parks include the terms 'economic' and 'non-economic' importance. 'Economic' benefit refers to "benefits that provide the ability to earn an income, to consume and to have assets" (Dudley and Stolton, 2012, 10). 'Non-economic' importance then includes any importance that is not included in economic importance.

Initial interview participants were members of the WTSP management council. After which, a snowball methodology was used where interview participants recommended other stakeholder representatives who may be willing and able to participate. In total, 13 key informant interviews were conducted and included land allotment owners within WTSP, residents of WTSP boundary communities, local and state non-governmental organizations, government, and industry. It should be noted that certain participants represented were members of multiple stakeholder groups, in which case they specified which benefits had which level of importance for each stakeholder group of representation. For example, government refers to both local and state government agencies, which are involved in, or impacted by, WTSP. However, these same individuals may also be a resident of a boundary community. Industry groups in the Bristol Bay region who are considered stakeholders of WTSP are members of the recreation and tourism industry, and the commercial salmon fishery, but may also own a land allotment within WTSP.

All interviews were conducted by a single researcher, and interviews were conducted both in person and over the phone. Responses to the questions on key informant values were recorded on written forms, and all in-person interviews were audio recorded. Each participant was asked to identify the level of importance to their stakeholder group(s) for each of the 16 listed benefits of WTSP. At the conclusion of each interview participants were given the

opportunity to list any other benefits that they thought WTSP provided to their stakeholder group(s) that had not been covered during the interview. Respondents were not required to provide a response for each question, and in some cases respondents felt they did not know enough to provide an answer for the importance of the benefit in question. Key informant interview responses were aggregated to estimate the level of importance. Analysis of the results and interview comments provide insight as to the benefits local communities receive from WTSP, the importance of these benefits, and how they impact the local communities.

Results of the interviews were recorded on spreadsheets (Appendix B). Spreadsheets components identifying type and scale of importance for each benefit for different stakeholder groups were completed. A count of total number of responses for the importance of each identified value of WTSP, for each stakeholder group, was recorded. A blank cell denotes no interview participants selected that level of importance for that benefit of WTSP for that stakeholder group. For some stakeholder groups, select options of importance would never be appropriate, those stakeholders were not asked those questions, and the boxes have been shaded (Dudley and Stolton, 2009, 14). For example, government or industry stakeholders could not benefits from something for subsistence purposes, and thus those levels of importance are not included for them. Employees of government or industry may benefit from subsistence or personal use activities, but a specific industry corporation or business, or a government office are not able to benefit from the harvest of resources for subsistence use. Also, some categories are not mutually exclusive, and participants could select multiple categories. Therefore, a benefit might already be of minor or major importance, but also have the potential to increase in importance.

3.4. Conclusion

The selected combination of methods used in this research allowed for a broader analysis of the values of WTSP, and distribution of the values. Research methods employed included a secondary data analysis of monetary values related to WTSP, a survey of recreational sport fishing visitors to WTSP, and key informant interviews with stakeholder group representatives. Through these methods the monetary and non-monetary benefits of WTSP were determined, and the distribution of those benefits was analyzed. The following chapter will present the results and discussion components of this research.

Chapter 4.

Results and Discussion

4.1. Introduction

The purpose of this research was to quantify and/or qualify the value of the benefits that Wood Tikchik State Park, Alaska, provides to different stakeholder groups. Chapter three included a description of the research site, and methods used in this research. The results of the secondary data analysis, survey, and key informant interviews, which were used to determine the benefits of WTSP to different stakeholder groups, form the first section of chapter four. Following the presentation of the results will be a discussion about the distribution of the various monetary and non-monetary benefits. Finally, the implications of the presence of salmon as a culturally-significant species in the region will be explored.

4.2. Results

4.2.1. Estimation of Monetary Direct Use Values of WTSP Using Secondary Data

Despite WTSP not having attained the scale of development originally envisioned in 1974, WTSP still provides considerable economic value. The annual monetary value of the contribution of WTSP to the commercial and subsistence harvest of salmon in the Bristol Bay region was estimated based on average escapement and the value of annual harvest. From 2013 to 2015 the annual value of the commercial Bristol Bay sockeye salmon harvest ranged from US$92.40 million to US$195.70 million (not adjusted for inflation) (Table 4-2). Based on the average escapement contribution of WTSP over those years (Table 4-1), I estimated the annual average value of the contribution of WTSP to the Bristol Bay commercial sockeye salmon harvest to be US$28.18 million.

Table 4-1: Counting Tower Estimates, Number of Sockeye Salmon, 2005-2010, 2013-2015 (Westing et al., 2006, Salomone et al, 2007, Sands et al., 2008, Jones et al., 2009, Morstad et al, 2010, Salomone et al., 2011; Jones et al,, 2014; Elison et al., 2015; and Jones et al., 2016).

Year	Wood River Escapement	Total Escapement	Wood River Percent Contribution
2005	1,496,550	13,947,279	10.73
2006	4,008,102	14,035,552	28.56
2007	1,528,086	14,341,356	10.66
2008	1,724,676	12,224,364	14.11
2009	1,319,232	9,046,184	14.58
2010	1,804,344	11,102,340	16.25
6-yr avg	1,980,165	12,449,513	15.81
2013	1,183,348	6,679,012	17.72
2014	2,764,614	11,212,730	24.65
2015	1,941,474	15,352,816	12.65
3-yr avg	1,963,145	11,081,519	18.34

Just over 50 percent of commercial harvest permits are held by Alaskan residents (Table 4-2). However, as the permits do not confirm the same amount of catch and profit, the distribution of value between Alaskan residents and residents of the lower 48 states is unknown. Though Knapp et al. estimate that in 2010, of the US$144 million in direct income gained from the Bristol Bay salmon fishery, US$50 million stayed in the state of Alaska. While currently, on average, WTSP contributes 18 percent of Bristol Bay salmon escapement, the lands within WTSP have protection status which prevents development. The Togiak Wildlife Refuge also provides protection status for a portion of the Bristol Bay river system (Bristol Bay Native Corporation, 2016), but the protection status of the remaining 82 percent of escapement is unknown, with at least a portion of this area having no protection from development.

Table 4-2: Estimated value of WTSP contribution to Bristol Bay commercial sockeye salmon harvest (Sands et al., 2015, 3)

Year	Value (US millions)	WTSP contribution (percent)	WTSP value (US millions)	Alaskan resident permits (percent)
2013	$138.80	17.72	$24.60	53.1
2014	$195.70	24.65	$48.24	52.25
2015	$92.40	12.65	$11.69	51.88
3-yr avg	$142.30	18.34	$28.18	52.41

Subsistence harvest data were collected by CSIS for four WTSP boundary communities between 2005 and 2010. Over those years, the average escapement attributed to WTSP was 15.81 percent (Table 4-1). Aggregating the total pounds caught for the four boundary communities, the approximate annual pounds of Sockeye and Chinook salmon harvested by boundary communities was 345,084 (Table 4-3). Based on the ADFG, Department of Subsistence value estimates of subsistence salmon of US$4 to US$8, the total annual value of boundary community subsistence is US$1,380,366 to US$2,760,672. At 15.81 percent, the value of annual subsistence harvest that can be attributed to WTSP is US$218,231 to US$436,462.

Table 4-3: Subsistence Harvest of Sockeye and Chinook Salmon in WTSP local communities (Alaska Department of Fish and Game, 2017c).

Community	**Year**	**Percent attempting to harvest**		**Percent Harvesting**		**Estimated pounds harvested**		**Total pounds harvested**
		Chinook	*Sockeye*	*Chinook*	*Sockeye*	*Chinook*	*Sockeye*	
Aleknagik	2008	71.88	78.13	65.63	78.13	12,640	5,494	18,134
Dillingham	2010	66.82	64.36	62.47	61.79	125,124	103,075	228,199
Koliganek	2005	82.10	92.90	71.40	85.70	29,087	28,879	57,966
Manokotak	2008	57.38	77.05	57.38	77.05	18,964	21,821	40,785

The other source of monetary value of WTSP is through commercial tourism and recreational activities. Data on visitor activity in WTSP each season comes from the commercial operators in WTSP. Commercial operators in WTSP include sport fishing lodges, hunting or fishing guides, equipment rental, and air taxis (Alaska State Parks, 2016). From 2011 to 2016 (excluding 2015) the number of commercial client days was recorded by Alaska State Parks, and categorized by the specific type of commercial activity (Figure 4-1).

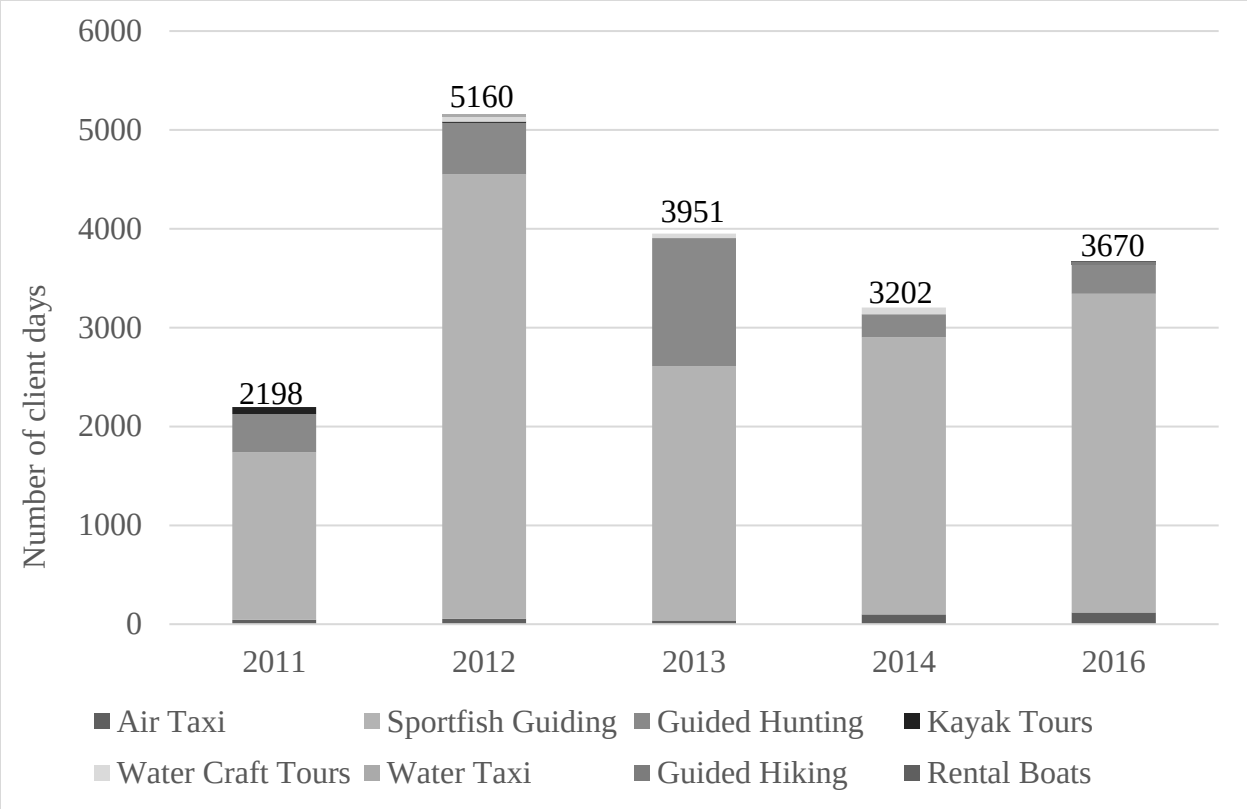

Figure 4-1: Wood-Tikchik State Park Client Days by Activity Type 2011-2014, 2016 (Alaska State Parks, 2016)

In 2016 there were 26 commercial permit holders operating in WTSP, with a total of 3670 client days reported. Almost 88 percent of the recreational client days were from commercial sport fishing lodges. There are seven commercial lodges located within WTSP, based on the posted prices on the websites of six of these lodges, the average cost of engaging the lodging and services of one of these fishing lodges, not including travel expenses and gratuities, was US$1,086.74 per day in 2016. With 3224 visitor days due to sportfish guiding, the estimated income of the sport fishing lodges from WTSP in 2016 was US$3.50 million. Alaska State Parks receives US$12 per person per day from commercial permit holders in WTSP (ADNR DPOR, 2010). In 2016, with 3670 client use days, the revenue to Alaska State Parks from WTSP was US$44,040. Alaska State Parks also receives a commercial permit application fee, however the number of permits applied for each year was not available for this study.

4.2.2. Results from Visitor Survey on Trip Expenditures and Characteristics

Survey responses were collected between July and August 2016 at one of the commercial fishing lodges in WTSP. Of the eleven responses received, nine contained complete data. While

this is a small number of responses, there was no other data available to examine the proportion of tourism dollars spent in WTSP which remain in the local area, and therefore, the results have been reported. Survey respondents were all male residents of the United States, from states other than Alaska. Other survey demographic questions included age and 2015 household income of survey respondents. Two respondents reported 2015 household income of US$100,000-US$149,999, and the rest all reported 2015 household income greater than US$200,000. The median household income in the United States in 2015 was $56,516 (United States Census Bureau, 2016). Eight out of nine survey respondents were 40 years of age or older.

The average length of time spent in WTSP was six days, and the average survey respondent was a member of a travel group of 4 people. Six out of nine respondents stated WTSP was their primary destination on this trip.

The survey examined the travel expenditures of visitors to WTSP. Survey respondents were asked to categorize expenditures into three categories: expenditures made on travel from place of residence to Dillingham, expenditures made in Dillingham, and expenditures related to activities within WTSP (Table 4-4). As all respondents were staying at a fishing lodge in WTSP, the expenditures in WTSP were likely paid to the fishing lodge. Sport fishing packages at several lodges in WTSP include transportation from Dillingham to the lodge, accommodations, meals, fishing equipment, and daily standard guided trips to fishing locations (Alaska's Bearclaw Lodge, 2017; Mission Lodge, 2016; Aleknagik Island Lodge, 2013; Tikchik Narrows, 2017). Additional expenses to visitors may include Aleknagik sales tax, fishing licenses, special request daily excursions, gratuities, or fuel surcharges.

Table 4-4: Expenditures of Visitors to WTSP

Expenditures type	Mean (USD)	St.Dev (USD)
Expenditures on travel from place of residence to Dillingham	$1,944.44	$1,733.57
Expenditures in Dillingham	$177.78	$323.18
Expenditures in WTSP	$4,066.67	$1,235.92

Average total trip expenditures for survey respondents were US$6188.89. However, on average, visitors to a WTSP fishing lodge only spent $177.78 in the city of Dillingham. Visitors

surveyed spent an average of US$694.71 per day in WTSP. This is almost US$400 less than the estimated cost per day based on the package prices published online for WTSP sport fishing lodges. However, as survey responses were all collected from a single commercial fishing lodge, the cost per day could be below the estimated average. All non-local visitors to WTSP incur, at a minimum, the cost of travelling from Anchorage to Dillingham, which is the only commercial flight option for flying in and out of Dillingham, offered by Alaska Air and Penair (Mission Lodge, 2016). As survey respondents all resided outside of Alaska, average travel expenditures were US$1944.44 to reach WTSP from their place of residence. The large standard deviations for all categories of expenditures reveal the significant variety in the value for all types of expenditures of visitors to WTSP.

4.2.3. Key Informant Interviews

Results of the interviews for the 16 identified values of WTSP were synthesized graphically representing the number of respondents who selected each level of importance for each value of WTSP (Appendix C). For some values multiple categories could be selected, and respondents were not required to answer all questions, or did not feel all benefits applied to them, the count of responses for each stakeholder group is not equal for each value. Benefits of major importance, for both economic and non-economic reasons, were reported by all stakeholder groups (Table 4-5).

Table 4-5: Benefits of WTSP of major importance as reported by stakeholder representatives (benefits listed in no particular order)

WTSP Land Owners	Boundary Community Residents	Local and National NGO's	Government	Industry
Fisheries for subsistence	Fisheries for subsistence	Fisheries for subsistence	Fisheries for Revenue	Fisheries for Revenue*
Hunting of Wild Game for Subsistence*	Hunting of Wild Game for Subsistence	Nature Conservation	Water Quality and Quantity (non-economic)	Commercial Water Use
Hunting of Wild Game for Revenue	Hunting of Wild Game for Revenue*	Nature Conservation for Economic Importance	Flood Prevention (non-economic)	Water Quality and Quantity (non-economic)
Non-commercial Water Use*	Use of Wild Food Plants for Subsistence		Recreation and Tourism for Revenue	Water Quality and Quantity (economic)
Water Quality and Quantity (non-economic)	Non-commercial Water Use*		Wilderness or Iconic Values	Recreation and Tourism for Well-being*
Sacred Natural Sites or Landscapes	Water Quality and Quantity (non-economic)		Building Knowledge	Recreation and Tourism for Revenue
Recreation and Tourism for Well-being*	Recreation and Tourism for Well-being		Climate Change Mitigation	Wilderness or Iconic Values
Wilderness or Iconic Values	Recreation and Tourism for Revenue*		Nature Conservation	Education*
Building Knowledge	Wilderness or Iconic Values		Nature Conservation for Economic Importance	Nature Conservation
Education*	Building Knowledge			Nature Conservation for Economic Importance
Nature Conservation	Building Knowledge as a Source of Revenue*			
	Education			
	Nature Conservation			
	Nature Conservation is of Economic Importance			

*Equal number of respondents reported this benefits was of major/minor importance

For land owners within WTSP, identified benefits of major importance, in no particular order, included the subsistence and economic value of fisheries, the non-economic values of water quality and quantity, sacred natural sites, education, nature conservation, and contribution of recreation to human well-being.

The benefits for which boundary community members unanimously identified as having major importance, in no particular order, were: nature conservation, wilderness/iconic values, non-economic importance of water quality and quantity, and fisheries for both revenue and subsistence. Most boundary community participants agreed that WTSP was of major importance to knowledge building and education, that recreation and tourism in WTSP was of major importance for human well-being and as a source of revenue, and that collection of wild food plants and hunting were of major importance to subsistence. In contrast, most boundary

community participants perceived that cultural and historical values were of minor importance, and that collection of medicinal resources from WTSP was of minor non-economic importance.

Cultural and historical values, as well as sacred natural values (defined as natural sites of sacred value: such as groves, waterfalls, or mountains), were primarily identified as being of minor non-economic importance by land owners in WTSP, and boundary community residents. There were no identified economic benefits from either cultural values or sacred natural sites. Indigenous community members were more frequently able to identify specific sites or locations that were of cultural or historical significance in WTSP, but non-indigenous community members still identified these values as important, even if not familiar with any specific locations within WTSP. Meaning that while some community members could not identify any specific historical or sacred natural sites within WTSP, they believe they existed and had value of some level of importance.

Interview participants from the WTSP boundary communities indicated a high level of local involvement in the fishery in Bristol Bay, working as captains or crew on commercial fishing boats, fishing for subsistence salmon or processing of subsistence salmon. The number of local residents involved in commercial fishing limited the number of interviews conducted, as many potential participants identified were not available due absence from the community and availability due to participation in commercial fishing during the study period.

For representatives of the industry stakeholder group of WTSP, benefits of major importance identified by at least two participants included the economic and non-economic value of nature conservation, revenue from the collection of genetic material, wilderness values, revenue from recreation and tourism, economic and non-economic benefits of water quality and quantity, commercial water use, and revenue from fisheries. Revenue from the collection of genetic material occurred from the housing of research scientists to local tourism businesses, who came to WTSP with the purpose of harvesting genetic material for research. Nature conservation and wilderness (iconic scenery) values were identified as important as the conservation and serenity of the wilderness are an attractor for visitors to the region, as support other values.

For the values of flood prevention and climate change mitigation ("providing significant carbon sequestration and / or by ameliorating local climate impacts" (Dudley and Stolton, 2009))

participants across stakeholder groups indicated they did not have enough knowledge or information to determine the importance of the contribution of WTSP to climate change mitigation, or that WTSP represents only a small factor in the global problem of climate change that they felt the impact was likely negligible. However, it was suggested by a couple participants that WTSP would be an excellent place to study the effects of climate change, as they see natural changes occurring in the park, and expect changes to continue. Most respondents simply stated they did not know whether the ecology of WTSP contributed to flood prevention in the area.

The sole NGO representative who participated in an interview, expressed that the association did not directly receive benefits from WTSP. However, as the association represents members of the local communities, the park was important for the benefits it provided to its' members. The benefits that were identified as being of some importance to non-governmental organizations and to government included economic and non-economic importance of nature conservation, revenue from hunting or fishing, non-economic value and revenue from knowledge building, revenue from recreation and tourism, and non-economic benefits from water quality and quantity and flood prevention.

4.3. Discussion

4.3.1. Distribution and Impact of Monetary Benefits of WTSP

Monetary benefits from the direct use of WTSP are received by multiple stakeholder groups, located across geographic regions. Stakeholder groups who identified themselves as receiving monetary benefits attributed to WTSP each year were local residents, the tourism industry, commercial fishing industry, and local and state government. These monetary benefits come from subsistence and commercial fishing, tourism, and government revenue.

Boundary community residents received an estimated annual monetary benefit of US$218,231 to US$436,462 from the harvest of chinook and sockeye salmon for subsistence purposes attributed to WTSP. Residents of Alaska hold just over half of the Bristol Bay commercial fishing permits. Between 2013 and 2015 WTSP contributed approximately US$28.18 million to the Bristol Bay commercial fishery, but the distribution of this value geographically cannot be estimated. The commercial tourism industry in WTSP contributed US$44,040/year to Alaska State Parks in 2016 in the form of revenue from park use fees, and

owners of the WTSP commercial fishing lodges received an estimated income of US$3.50 million in 2016.

The money collected from Alaska State Parks for client use fees and commercial permit fees in WTSP make up around 40 percent of the WTSP budget (ADNR DPOR, 2002, 5-6). Fees have increased since 2002 per day for client use from US$8 to US$12, while commercial permit fees have remained at US$300 per year (ADNR DPOR, 2010, 17). In 2016, Alaska Parks collected an estimated US$44,040 from commercial client use of WTSP.

The distribution of annual visitor days, and therefore revenue, amongst the seven commercial WTSP fishing lodges is not known. The capacity and cost of visiting each lodge is different, though the general geographic distribution of monetary benefits can be examined based on ownership of the commercial lodges. Of the seven commercial fishing lodges operating in WTSP, only one is locally owned and managed by the Bristol Bay Native Corporation, and one is owned by a resident of Alaska. Ownership of the five other fishing lodges is held by residents of the lower 48 United States. The two locally owned lodges have a higher visitor capacity than many of the remaining lodges. While employment data at these lodges were not available, questions asked during key informant interviews indicate that very few employees are from the local region, due to lack of training, and unavailability of local employees due to involvement of local residents in subsistence and commercial fishing during the recreational season.

While the survey results show visitors do spend money in Dillingham, leading to economic benefits to the local community from visitors, this amount was very small. Also, as only the number of visitor days is known, not the number of visitors, an estimate of expenditures in Dillingham is difficult to estimate. Visitor packages at sport fishing lodges in WTSP are typically six days, which was confirmed by survey respondents who also cited an average trip length of six days. Of all the visitor days in 2016, 3,224 were attributed to sportfish guiding lodges in WTSP. At an average of six days of stay per person, there were an estimated 537 visitors to WTSP fishing lodges in 2016. Assuming that each visitor spent the average amount of US$178, as reported by the visitor survey, the total estimated expenditures by fishing lodge visitors in Dillingham, in 2016, would be US$95,586.

These visitors would account for the 88 percent of visitor activity in WTSP, which occurs at sport fishing lodges. Visitors who spend time in local accommodations, such as bed and

breakfasts, which are not located within WTSP are not tracked by Alaska State Parks, or any other information source. Websites of most lodges indicated that visitors are taken directly from the Dillingham airport to the fishing lodges. However, at least one lodge does recommend visitors spend a night in local accommodations prior to travelling to the lodge (Fishing Bear Lodge, 2009). So the expenditures made by fishing lodge visitors are likely not exclusively for accommodation. There is potential that the other 12 percent of commercial visitors do engage local accommodations, which would provide greater economic benefits to the local region.

An important potential contributor of economic benefits to different stakeholder groups, which was not examined in this paper, was employment. The tourism sector in WTSP employs guides and hospitality staff, however the number of employees is not known or recorded by any entity, nor is the residence of these employees. As many of the boundary community residents spend the summer months participating in subsistence activities, or commercial fishing, few participate in the tourism sector (Personal Communication, June 2016). Efforts have been made in the Bristol Bay region to develop opportunities for local residents to become involved in the sport fishing tourism industry (Bristol Bay Fly Fishing & Guide Academy, 2017a). Opportunities to participate in the tourism industry in WTSP provide an alternative employment or income sources for interested residents. Increased participation from local residents in the industry may also allow for a cultural influence on the tourism activities and development which occur in WTSP.

In 2008, local Bristol Bay residents and a local lodge owner founded the Bristol Bay Fly Fishing & Guide Academy (Bristol Bay Fly Fishing & Guide Academy, 2017a). Hosted annually, the course is designed for local young adults, to educate and prepare them for careers involving salmon stewardship in the local rivers (Bristol Bay Fly Fishing & Guide Academy, 2017b). With 10-15 participants, each year the education component includes biology, river ecology, as well as skills training from expert fly anglers. The lodge that hosts the guide academy each year rotates, and the 2016 Guide Academy was hosted by Mission Lodge outside WTSP. The continuation and participation in this program shows a willingness of local residents to become involved in the sport fishing sector of the Bristol Bay tourism and recreation industry.

All the direct use values from WTSP that can be assigned a monetary value using available secondary data can be attributed to the salmon and other fishery resources in the region,

whether through the direct harvest of these resources, the habitat WTSP provides, or the attraction of the presence of salmon for tourism purposes. The importance of salmon in the local region contributed to the availability of related data. While not all of the monetary benefits stay in the local communities, and the expenditures of commercial tourists in the local area thought to be limited compared to total visitor expenditures, it is important to highlight that the monetary benefits of WTSP are dependent on the continued presence of harvestable salmon.

4.3.2. Distribution and Impact of Non-Monetary Benefits of WTSP

Understanding the scope of other WTSP benefits and their distribution was obtained through the key informant interviews. Interviews with boundary community residents allowed not only for a general identification of the benefits WTSP provides, but also for analysis of the types and ways these benefits impact the boundary community members. Of the 16 values considered, boundary community residents and WTSP land owners identified the greatest number of benefits of importance to them, compared to other stakeholder groups. Boundary community residents also identified the highest number of identified benefits of major importance, with industry representatives identifying the second highest number of benefits. While boundary community residents did not receive as much of the monetary values discussed previously, they do indicate receiving a number of benefits of importance to the communities, and identify more benefits of major importance than other stakeholder groups considered.

Fishing, hunting, collection of food plants, and collection of medicinal resources were all identified as benefits with some level of importance for boundary community residents, and access to these resources was identified as a barrier to greater importance of these benefits to a higher number of local residents. There are no roads leading directly into WTSP, the sole road leads to the community of Aleknagik after which access to the park is by boat travelling up the lake system, or by float plane. Residents without access to these modes of transportation may be excluded from the benefits of harvesting resources within WTSP, due to the high cost of securing and operating these modes of transport.

Multiple boundary community participants readily acknowledged the connections between the range of benefits provided by WTSP. Salmon is a key resource in the region, and frames many of the activities which take place in WTSP. Therefore, many values that WTSP provides are not only considered as important for direct benefits, but also as these values can

indirectly ensure the continued provision of salmon. Two specific cases of the linkage between salmon and other park values that were mentioned during interviews were the importance of water quality and quantity, since water resources ensure healthy habitat for the salmon, and conservation of the area. Nature conservation is valued on its own, but also as it guarantees protection of the salmon spawning grounds contained within WTSP. The values of WTSP are important to a boundary community on their own, but are of even greater importance because of the need for all values to support the continuation of the WTSP system. While the questions primarily asked respondents of the importance of direct use values of resources within WTSP, the indirect use values of other WTSP benefits are required to support the direct use values.

While not explicitly stated by participants, the range of, and connections between values described are similar to the categories and connections in the ecosystem services framework. The categories of the ecosystem services framework are: provisioning services, supporting services, regulating services, and cultural services (Kettunen and ten Brink 2013, 15). As mentioned by interview participants, the provisioning service is the provision of salmon for food, which requires the regulating services of maintaining stream flows and the supporting services of habitat protection. Cultural services are also provided as salmon support local cultural heritage and traditions, aesthetic values, and information for knowledge and education. These connections support the use of a framework like the Ecosystem services framework as a basis for understanding protected area benefits and services.

Knowledge and education endeavors in WTSP are carried out by two primary organizations: the University of Washington and the Bristol Bay Economic Development Corporation. Discussions around the contribution of knowledge from WTSP focused on the University of Washington Fisheries Research Institute. The Fisheries Research Institute (FRI) was established in 1947 at the request of the commercial canning industry in Bristol Bay (University of Washington School of Aquatic & Fishery Sciences, 2013). Annual salmon season research programs are run out of two FRI locations, one within WTSP at Lake Nerka, and one just outside WTSP boundaries on Lake Aleknagik. They contribute significant salmon and ecosystem research, specifically valuable due to the length of time over which data has been collected. Some boundary community residents did express a wish for more information sharing

between FRI and the local communities, to understand the work they do, as well as to know results of research studies related to the local salmon populations.

Boundary community residents identified the value of education of WTSP to be of major importance, they also identified the potential to increase the importance of education in WTSP. Salmon Camp is currently the primary method of formal education in WTSP. Run by the Bristol Bay Economic Development Corporation (BBEDC), Salmon Camp is an opportunity for middle and high school students from the Bristol Bay area to learn about and experience hands on ecosystem and salmon science and management. The camp is hosted in various locations on Lake Aleknagik during the summer months each year (Bristol Bay Economic Development Corporation, 2016). The camp occurs over three weeks each summer, each week camp is offered to a different age group of students, from Grade 6 to Grade 12, all expenses of attending Salmon Camp are covered by BBEDC.

Cultural, historical, and sacred natural values of WTSP were cited to be of minor importance to the boundary communities by interview participants from the local resident stakeholder group. Again, access to these places could be a limiting factor for visiting, or sharing of knowledge of these places. As WTSP contains the traditional lands of the Yup'ik peoples, the area is thought to contain historical trap line or cabin sites, as well as old village sites (Personal communication, July 8th, 2016). Places of cultural significance within WTSP have begun to be accounted for and mapped through the Bristol Bay Native Place Names Project (Bristol Bay Online! Native Place Names Project, 2016a). The objectives of the project are to collect, preserve, and share the native place names of locations within Bristol Bay. The project saw the development of a mapping database, with names contributed by multiple organizations and people (Bristol Bay Online! Native Place Names Project, 2016a). The mapping and sharing of this traditional information in the boundary communities has the potential to highlight recognition and increase the importance of cultural and historical values for WTSP land owners and boundary community residents. The sharing of knowledge of areas of special significance may have limited the number of stakeholder representatives who viewed these values as important, as not all representatives were aware of significant sites within WTSP. The sharing of scientific and cultural information about WTSP with the boundary community residents may increase the importance of connected values of WTSP to the communities. Again, demonstrating

the cultural services provided by WTSP, which might not be possible without the other services provided by WTSP.

Geographic location of tourism and recreation based businesses also influenced whether certain benefits were of minor or major importance. Services located in Dillingham did not view recreation in WTSP as significant a benefit as services located within or bordering WTSP. Tourism service operators also viewed the collection of genetic material in WTSP as of minor importance to revenue, since visiting researchers or government scientists have engaged the services of local accommodations or air taxis in the past. These owners also reflected that the components that make up the tourism and recreation industry around WTSP have very different operations, specifically the sport fishing lodges, compared to all other services.

As the Bristol Bay region is a resource rich, largely undeveloped area, residents do not need to travel to the park to harvest resources they are interested in. However, WTSP does represent a protected reserve of these resources such that should the surrounding area become more developed, the importance of the park to residents of boundary communities would significantly increase. Through the course of interviews potential areas of conflict between stakeholders were identified. These areas included congestion and noise inconveniences on Lake Aleknagik due to tourism-related volume during the summer, as well as past and potential conflicts around management decisions in the park which do not please all stakeholder groups, specifically around new developments that are not perceived as in alignment with current land use designations. For example, in 2009, two hydroelectric projects were proposed to occur within WTSP borders (Nushagak Electric and Telephone Cooperative, 2009, 2). While these specific projects were never licensed, environmental, scientific, and engineering assessments were conducted, and the potential for other controversial development projects in the region remains (Angstman, 2016).

4.3.3. WTSP and Salmon as a Culturally Important Species

The connections between the different components of ecosystem services have been readily acknowledged, specifically in the ecosystem services framework. The framework emphasizes the interactions between benefits humans receive from ecosystems, such as provisioning, regulating, cultural, and supporting services (Millennium Ecosystem Assessment, 2003, 56). These connections have also explicitly been acknowledged in the context of

Indigenous peoples and fisheries (Noble et al., 2016, 22). Culturally significant fish species can help communities by supporting cultural, social, and economic well-being (Noble et al., 2016, 22). Research into fisheries management opinions in Alaska found that the Ahtna (Indigenous people of the area) of Copper River, Alaska incorporated sociocultural, economic, and environmental factors into their opinions about fisheries management (Naves et al., 2015, 210). As in this Copper River study, in this WTSP study local residents acknowledged and emphasized these connections between salmon, and other sociocultural, economic, and environmental benefits of WTSP.

The results of the key informant interviews in WTSP clearly support the importance of the connections between culturally-important species and other social and ecological benefits provided by protected areas. For WTSP, salmon is a significant food source, and the connections between salmon and other benefits of WTSP including water quality and quantity, nature conservation, cultural and historical values, as well as recreation and tourism values were identified by multiple participants throughout this study. The recognition and understanding of culturally significant species can aid in conservation and maintaining ecosystem health (Garibaldi and Turner, 2004, 1).

The recognition and inclusion of culturally-significant species in management decisions of protected areas can increase the social-ecological resilience of systems, and can "enhance management approaches to sustain Indigenous and non-indigenous people" (Noble et al., 2016, 22). While the monetary value of subsistence harvest of salmon from WTSP can be estimated through the replacement cost, the connections between salmon and other environmental, social, and economic health and well-being factors suggest that the monetary replacement value only accounts for a small portion of the benefit value, and therefore, could be considered a lower bound of the value of salmon presence and harvest from WTSP.

4.4. Conclusion

The analysis revealed that monetary values from WTSP related to salmon were distributed across stakeholder groups, while monetary values from recreation in WTSP did not remain in the local area. Non-monetary benefits from WTSP were also valued by boundary community residents, not just benefits related to harvest and access of resources. Some non-monetary benefits identified of some importance included water quality and quantity, cultural

and historical values, knowledge, education, and nature conservation. The combination of monetary and non-monetary data demonstrated that protected areas can provide a variety of benefits to boundary communities in the north, and that these benefits are important to stakeholders of the protected area.

Future management decisions for northern protected areas can be informed though the understanding of the types of benefits northern protected areas can provide to boundary communities, supported by the understanding of the context in which the benefits occur. The combination of monetary and non-monetary benefits, as well as their distribution can support decision making, and the continued protection of northern park lands. To ensure the protected areas in north provide benefits to boundary community residents the linkages between culturally-significant species, and cultural, economic, and social benefits need to be acknowledged, and participation should involve all stakeholder groups.

Chapter 5.

Conclusions

5.1. Conclusion

Parks and protected areas in the north have the potential to provide many benefits to local and non-local populations. These benefits cover a variety of themes, and range from material goods and services such as food and water, to non-material benefits including cultural or spiritual services or knowledge. Problems that have been identified with previous value assessments of protected areas are the lack of attention paid to the distribution of those values, and the narrowness of scope of values considered (Kettunen and ten Brink, 2013, and Pabon-Zamora et al., 2008). The methodology employed in this research sought to take a more integrated approach to understanding the benefits protected areas provide, using methods that allowed for the consideration of monetary and non-monetary benefits, as well as the distribution of these benefits.

Wood-Tikchik State Park (WTSP), Alaska, provides several direct use economic benefits to stakeholders of the park, primarily based on the salmon industry, and the tourism and recreation sector in WTSP. An estimated 18 percent of salmon escapement into Bristol Bay originates in the salmon spawning grounds in WTSP. Therefore, a portion of the salmon harvest in Bristol Bay can be attributed to WTSP. The importance of the escapement contribution of WTSP to the Bristol Bay fishery may increase in future years, as not all lands which contain the water systems which support the fishery have protection status. The potential for development on unprotected lands may influence the escapement contributions of other rivers in the Bristol Bay area, increasing the importance of the contributions from rivers within protected lands.

While most tourism and recreation direct economic benefits do not remain in the local area, the escapement contributions of WTSP to both commercial and subsistence fishing provide benefits to Alaskan residents and the local communities. Survey results of expenditures of fishing lodge visitors show that a very small portion of travel expenditures are spent in the area around WTSP, specifically in Dillingham. Also, the ownership of tourism and recreation service businesses shows that many benefits from commercial tourism activity in WTSP are not experienced by local, or Alaskan residents.

All the calculated monetary benefits of WTSP included in this research were directly, or indirectly, related to presence of salmon in WTSP. However, through the completion of key informant interviews, it can be stated that benefits of WTSP to boundary communities come not only from direct access to resources within WTSP, but also from the non-economic values of wilderness, nature conservation, knowledge, education, or other scenic values.

Previous research has indicated that boundary communities predominantly bear the costs inflicted by protected areas, such as restrictions on access or harvest of resources, or damages from protected area species or increased visitation (Mackenzie, 2012, 119). However, this research has shown that the residents of boundary communities place great importance on the benefits that they receive from WTSP, due to the economic support it provides to local industry, as well as its' contribution to the well-being of local residents, through recreation, cultural services, and conservation. The unique characteristics of land ownership within WTSP, and the ability of local residents to access and harvest many resources from the park contribute to the importance of WTSP.

The benefits considered of major importance by boundary community residents, WTSP land owners, government, and industry representatives cover all categories of the ecosystem services framework. While the connections between the different benefits were not explicitly stated by all stakeholder groups, the importance of values from all categories reflect the connections. The provision of salmon as a food source was of major importance to all stakeholder groups, as was the regulating service of water quality/quantity, the supporting service of nature conservation and biodiversity protection, and the cultural services of aesthetic values, and recreation and tourism.

The results of this methodology demonstrate the northern PPAs have the potential to benefit boundary communities through monetary and non-monetary provisions. Understanding the types, and ways, which PPAs can provide benefits to both Indigenous and non-Indigenous boundary community members will inform PPA governance and management decisions, and provide support for the continued protection of parks in the north. Considering both the monetary and non-monetary benefits of WTSP, and the distribution of these benefits across stakeholder groups, can enable outcome driven decision making in northern protected area management.

Developments in the Bristol Bay region have often been opposed based primarily on the potential risk of damage to salmon species and habitat in the area (Angstman, 2016). However, the results of this study demonstrate the connectedness between salmon and other values that benefit local community members. Therefore, proposed development projects within or near WTSP threaten a much wider range of benefits, many of which cannot be assigned a monetary value.

The recognition of the connections between salmon and various cultural, economic, social, and environmental benefits of WTSP by boundary community residents emphasize the significance of salmon in the perception of importance of benefits that WTSP provides. Management of northern protected areas needs to recognize the connections between benefits of protected areas, and the importance of culturally-significant species, as well as ensuring participation and communication of relevant stakeholder groups.

5.2. Limitations

The methodology of this study was developed to attempt to address two criticisms of protected area assessment: narrowness of scope, and lack of attention to distribution of benefits. The consideration of monetary and non-monetary values through a secondary data analysis and interviews using the Protected Area Benefits Assessment Tool (PA-BAT) was intended to widen the scope of benefits considered in this assessment. While a wide variety of benefits were considered, they were only able to be considered as a surface glance at the variety of benefits, meaning the depth of the study was less, though the scope was wide. While this methodology does provide a starting point for widening of scope of value assessments, and consideration of distribution of benefits, it does not address the many criticisms of protected area assessments and the treatment of cultural and other intangible values. As the information presented as a result of this methodology does not truly capture the complex cultural services which may be provided, or consider the intricacies of human ecosystem interactions. While the PA-BAT could be useful for community level assessments, where there may be a shared understanding of the cultural benefits and their importance, the depth of consideration of cultural, sacred value, and other intangible values in this methodology could be improved.

The primary limitation of this research study was the number of respondents, both in the key informant interviews, and the survey of visitors to Wood-Tikchik State Park (WTSP). Only

13 key informant interviews were conducted, across five stakeholder groups. This limited the conclusions drawn, and the representation of each stakeholder group. While WTSP land owners, boundary community residents, and tourism industry had multiple respondents, a single member of both government and non-governmental organizations participated in the study. Greater representation from these groups would have allowed for greater understanding of the benefits these groups receive.

A sample size of nine responses was achieved for the survey of visitors to WTSP. This very small sample size compromised the statistical significance of the conclusions drawn from the analysis. While general conclusions could be inferred, minimal analysis was conducted, and analysis could not be statistically supported. To truly understand the characteristics of travelers to WTSP, and the distribution of expenditures of visitors, a larger sample of visitors would need to be surveyed, from multiple lodges in the region. It would also strengthen the analysis to have been able to include visitors who did not stay at a fishing lodge in WTSP.

Another limitation was the availability of secondary data for the estimation of the monetary benefits of WTSP. Data on annual commercial harvest, in Bristol Bay, and annual number of commercial visitors to WTSP, was consistently collected over time. However, other potential benefits had limited or no data available. Employment in WTSP due to tourism is potentially a significant benefit, for which no data were available or collected. There were also no data available on non-commercial recreation. Data on subsistence harvest was also limited as it was not collected in all boundary communities, and for the communities it was available, data were available for different years.

A final limitation in the methodology of this research was the inability to gain consensus of the importance of non-monetary benefits of WTSP to stakeholders through the use of interviews. While all interview participants were given the same definitions of importance, understanding across all participants may not have been the same. Therefore, while a count of indicated responses can indicate the level of importance of each benefit, it does not represent consensus between members of each stakeholder group. In situations where an equal number of participants selected each category of importance, a conclusion cannot be drawn. Having multiple respondents together to discuss the questions, or stakeholder meetings, would allow for

consensus of importance, or greater understanding of which population subgroups receive which level of importance, and strengthened conclusions.

5.3. Areas for Future Research

The Protected Area Benefits Assessment Tool (PA-BAT) was shown to be effective as a semi-structured interview guide to understand the benefits of protected areas to different stakeholder groups. However, the categorization of importance of benefits, and small number of respondents limited the quantitative analysis of these interview results. Future projects making use of the PA-BAT as a component of their methodology may wish to modify the tool, specifically the categories of importance, and medium of application, to increase potential analysis of results.

The list of potential protected area benefits contained in the PA-BAT were comprehensive in this study, however, issues with the categorization of benefits did occur. Future use of the PA-BAT should consider a ranking of importance of the benefits within the PA-BAT using Likert scale responses, rather than categories of major or minor importance. The use of a Likert scale would involve defining multiple categories of importance on the response scale, such as: very unimportant, unimportant, neither unimportant or important, important, and very important. Another method would be the use of a number scale with zero being very unimportant and the highest value being very important. This would also allow for greater understanding of relative importance of benefits to boundary communities. The current structure of the PA-BAT allows for grouping of all benefits of major importance, but not relative importance between benefits of major importance. Through a greater understanding of the relative importance of the benefits, it may allow for greater incorporation of the monetary values estimated in the analysis of non-monetary values. Understanding the relative importance of values which can be assigned a monetary value, compared to other benefits, would allow for greater inference of potential value of non-monetary benefits. Using a Likert scale would also increase the opportunities for statistical analysis which could be conducted on the collected data.

The use of the Likert scale might also allow for the PA-BAT to be completed through paper or online mediums, not just through interviews. The ability to distribute the survey through means that would not require the physical presence of the researcher would expand the number of potential participants, and allow for participants to be contacted in the winter months, when

non-boundary community stakeholder representatives do not reside in the local area. A pilot study would be needed to see whether respondents would respond in same amount of detail about the values, if given an opportunity, as they did in an interview setting. A combination of in person and paper or online mediums may provide the most useful and informative set of data. `

Further research focused on collecting information on visitors of protected areas in the north which are difficult to access would aid in greater understand of the benefits and expenditures of these visitors in the local regions. Understanding the type of visitors, reasons visitors to come to the north, and the expected frequency of trips, could assist in the development of recreation and tourism services in northern parks.

The necessary presence of tourism operators which organize and provide supplies to visitors shows a potential for benefits to be gained by local populations. However, the requirements to be involved in this area, and the limitations which prevent local involvement need to be investigated. WTSP, or another northern remote protected area would be an excellent area for an in depth travel cost analysis, as in these remote areas it is unlikely multiple destinations would be an issue.

The methodology in this research study could be replicated in other northern parks and protected areas, to confirm or challenge the results found in WTSP. Consideration for other protected areas to research should be given to protected areas where harvest of resources is not permitted, or where a single dominant species of importance is not present, which may be reflected in the importance of benefits to local communities from that protected area. Many benefits identified in WTSP were related to salmon, a key species in the region. Replication of this methodology in other protected areas may show a relationship between benefits of protected areas to boundary communities and the presence of a key species.

5.4. Policy Implications

This research has implications for the management and policy of protected areas in the north. The results of this research show the context in which a protected area can benefit boundary communities. The management and ecological characteristics of Wood-Tikchik State Park (WTSP) that supported these benefits can inform and demonstrate how other northern protected areas can be managed to maximize benefits of any protected area to boundary communities or other stakeholders of interest. Understanding how, and in what situations,

northern protected areas can benefit boundary communities can help to inform management decisions in current protected areas, and assist in the strategic development of new northern protected areas.

If most of the benefits recognized by boundary communities from protected areas are dependent on access to resources within protected area boundaries, this could have implications for established protected areas with limitations or restrictions on the harvest or access of resources from the protected area. The connections between the presence of salmon and various social, cultural, and economic factors seemed to influence the opinions of the importance of many benefits of WTSP. Should the harvest of salmon be restricted, or outside factors influence the availability of salmon, this may negatively affect the perceived importance of other benefits of WTSP.

The results of this study in WTSP could also guide development of tourism activities in northern protected areas. Commercial tourism endeavors in WTSP have been successful, but the benefits are not remaining in the local community. Tourism development in other protected areas should explicitly consider mechanisms for local benefit and involvement.

Policy changes regarding the management of northern protected areas are currently occurring. In March of 2017, regulations regarding hunting on federal wildlife refuges in Alaska were repealed by the United States Senate (Martinson, 2017). This change has fueled heated conversations about the impacts on subsistence hunting near these refuges, predator control, and who is and should be responsible for management decisions in protected areas. Policy and management are dictated by the perceived purpose of the protected area, which is the underlying issue in the altering of refuge regulations (Martinson, 2017). The benefits of WTSP demonstrate the wide variety of benefits northern protected areas can provide to stakeholder groups. The management and provision of benefits from protected areas will depend on the designated purpose and goals of the protected area. To increase the benefits to boundary communities, the purpose of northern protected area establishment and management may need to be altered.

The results of this research could also be used in situations where resource development in a local area being considered, such as the Northern Dynasty Minerals Pebble Project. The Pebble Project has again been highlighted in the media following the 2016 United States Presidential election. Since the election of President Trump in 2016, Northern Dynasty Minerals

Ltd. stock has quadrupled in value (Sohn, 2017). In January, the Northern Dynasty CEO expressed that he expected the situation with the EPA, which is currently holding up the Pebble Project, would be resolved within 100 days. He also indicated that President Trump was willing to issue a permit for the Pebble Project (Sohn, 2017). These statements do not guarantee that the Pebble Project will eventually be completed, but it is looking more possible than last year.

The analysis of benefits of protected areas in Alaska demonstrates the potential value of lands to local residents and other stakeholders if left undeveloped. The potential economic impacts of The Pebble Project would be significant to local communities. However, this research shows that there are economic and non-economic benefits of value to stakeholders from leaving land undeveloped and ensuring these natural systems maintain a high level of function.

APPENDIX A
Survey of Visitors to Wood-Tikchik State Park:

1. What is your State/Province and Country of Residence?

   State/Province: _____ Country: _____

2. How many times have you visited Wood-Tikchik State Park in the last 10 years? _____
3. How many days was your visit to Wood-Tikchik State Park? _____
4. On this visit, how many people are in your travel group? _____
5. On this visit, was Wood-Tikchik State Park your primary destination?

   (Circle) **Yes** **No**

   If **no**, what were the other destinations of your trip? _____

6. What was the approximate cost, per person, of travelling from your place of residence to Dillingham? (i.e. flights and other travel costs, not including amount paid to lodges, guides, or other in park service providers)

   $_____USD

7. What was the approximate cost, per person, of your time in Dillingham? (i.e. local restaurants, shopping, or bed and breakfast)

   $_____ USD

8. What was the approximate cost, per person, of your time in Wood-Tikchik State Park? (i.e. stay at lodges, engagement of guide or flight services, equipment rental, permits, tips, etc.)

   $_____USD

9. What is your gender? (Circle) **Female** **Male**
10. What is your age?

    □ 18-24 years old □ 25-39 years old □ 40-64 years old □ 65 years and older

11. What was your total household income in 2015 ($USD)?

    - □ Less than $10,000
    - □ $10,000 - $14,999
    - □ $15,000 - $24,999
    - □ $25,000 - $49,999
    - □ $50,000 - $99,999
    - □ $100,000 - $149,999
    - □ $150,000 - $199,999
    - □ $200,0000 or more

APPENDIX B
Aggregated Wood-Tikchik State Park PA-BAT Responses

Value of the Resource	WTSP Land Owners	Boundary Community Residents	Local and National NGO's	Government	Industry
Fisheries					
Fisheries are of major importance to subsistence	2	7	1		
Fisheries are of minor importance as a source of revenue					2
Fisheries are of major importance as a source of revenue	1	7		1	2
Hunting of Wild Game					
Hunting is of minor importance to subsistence	1	2			
Hunting is of major importance to subsistence	1	4			
Hunting is of minor importance as a source of revenue		1		1	2
Hunting is of major importance as a source of revenue	1	1			1
There is potential to increase the economic importance of hunting		1			
Use of Wild Food Plants					
Collection is of minor importance to subsistence	2	2			
Collection is of major importance to subsistence		5			
Collection is of minor importance as a source of revenue		1			1
Collection of Medicinal Resources					
Local use of medicinal resources is of minor importance to subsistence	1	5			
Local use of medicinal resources is of major importance to subsistence		1			
Local use of medicinal resources is a minor source of revenue					
Water Use					
Non-commercial water use is of minor importance to subsistence	1	3			
Non-commercial water use is of major importance to subsistence	1	4			
Commercial water use is of major importance as a source of revenue					3
Water Quality and Quantity					
The role of WTSP in water quality and quantity has a major non-economic benefit	2	7		1	3
The role of WTSP in water quality and quantity has minor economic benefits	1				
The role of WTSP in water quality and quantity has major economic benefits		2			3
Flood Prevention					
The role of the PA in flood prevention has a minor non-economic benefit		1			
The role of the PA in flood prevention has a major non-economic benefit		1		1	

Value of the Resource	WTSP Land Owners	Boundary Community Residents	Local and National NGO's	Government	Industry
Cultural and Historical Values					
Cultural and historical values are of minor non-economic importance	1	5			
There is potential to increase the non-economic importance of cultural and historical values					1
Sacred Natural Sites or Landscapes					
Sacred values are of minor non-economic importance		2			1
Sacred values are of major non-economic importance	1	1			
Recreation and Tourism					
Recreation and tourism is of minor value to human well-being (i.e. for health and relaxation)	1	1			1
Recreation and tourism is of major value to human well-being	1	5			1
Recreation and tourism is of minor importance as a source of revenue		3			
Recreation and tourism is of major importance as a source of revenue		4		1	4
There is potential to increase the economic importance of recreation and tourism	1	2	1		1
Wilderness or Iconic Values					
The wilderness/iconic values are of major importance	2	7		1	4
Building Knowledge					
WTSP is of minor importance to building knowledge		1			3
WTSP is of major importance to building knowledge	1	6		1	
There is potential to increase the importance of knowledge building		1			
Knowledge building is a minor source of revenue		1		1	1
Knowledge building is a major source of revenue		1			
Education					
WTSP is of minor importance to education	1	2			1
WTSP is of major importance to education (i.e. runs education programmes and has staff and facilities)	1	5			1
There is potential to increase the importance of educational activity	1	2			
Educational activity is a minor source of revenue		1			
Collection of Genetic Material					
Genetic material is of minor non-economic importance		3			
Genetic material is of major non-economic importance		1			
Genetic material is a minor source of revenue					2
Climate Change Mitigation					
WTSP provides minor benefits through carbon sequestration/local climate stabilization	1	1			1
WTSP provides major benefits through carbon sequestration/local climate stabilization		1		1	
Nature Conservation					
The nature conservation value of the protected area is of major importance	2	7	1	1	4
The nature conservation value of the protected area is of major economic importance		2	1	1	3

APPENDIX C

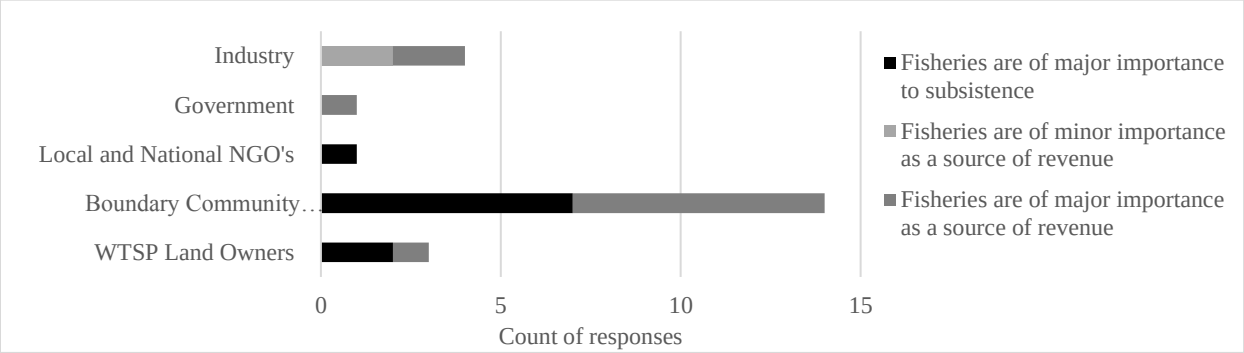

Figure C-1: Stakeholder Responses: Importance of Fisheries (permissible fishing and/or contribution to fish stocks by protecting spawning area)

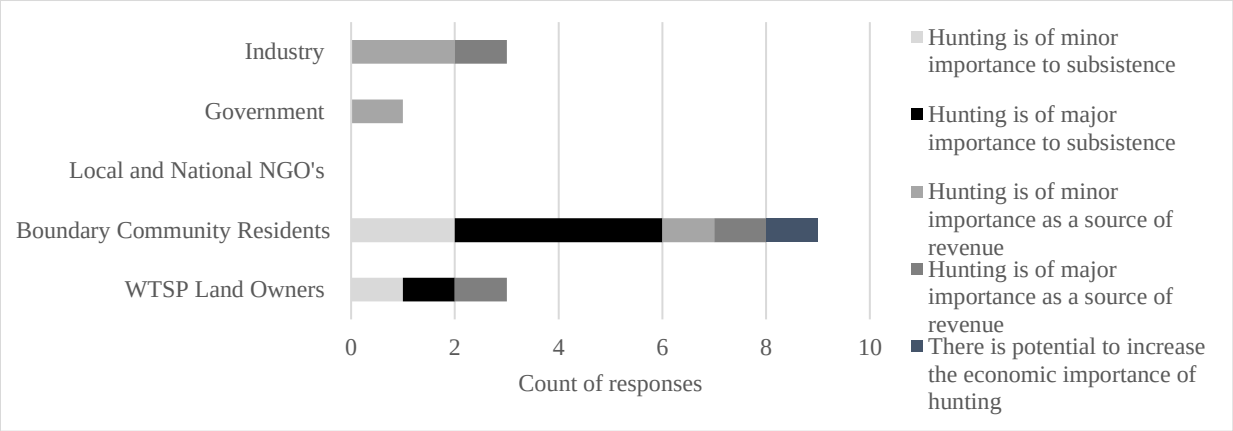

Figure C-2: Stakeholder Responses: Importance of Hunting of Wild Game

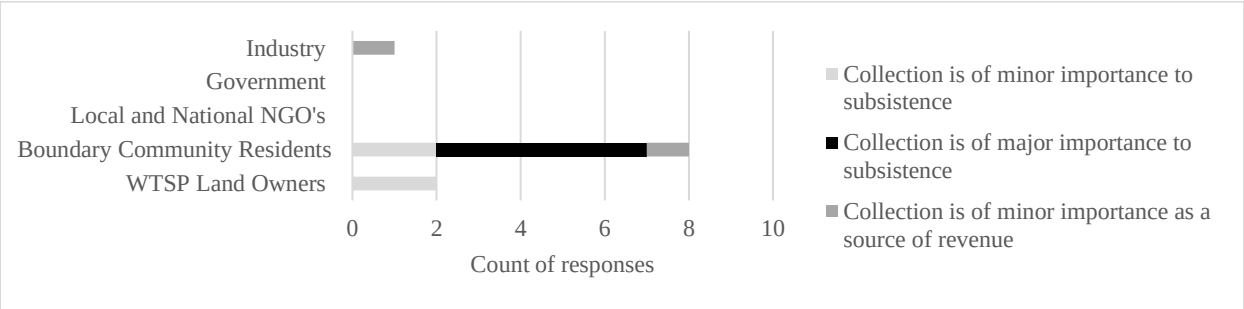

Figure C-3: Stakeholder Responses: Importance of Use of Wild Food Plants

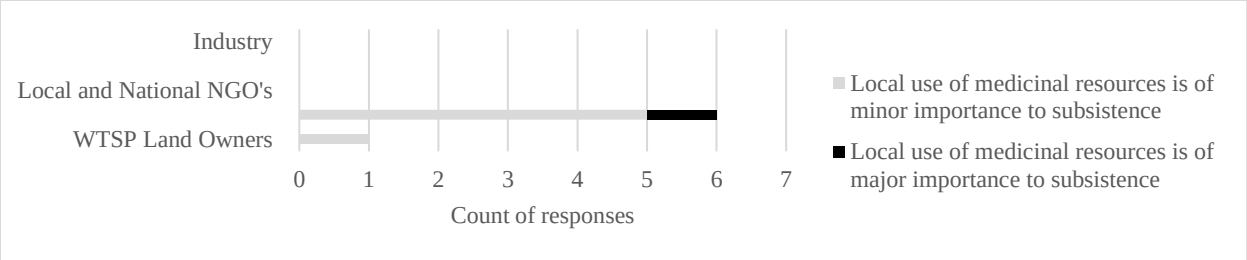

Figure C-4: Stakeholder Responses: Importance of Collection of Medicinal Resources

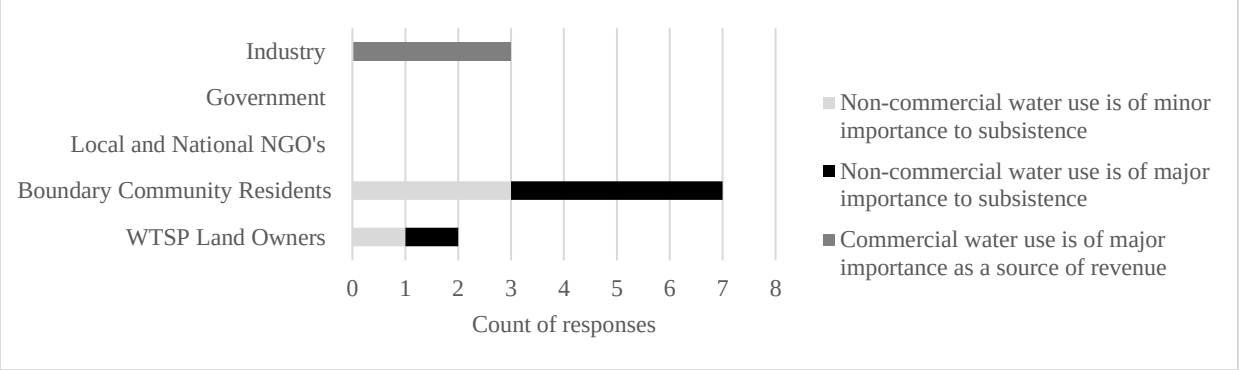

Figure C-5: Stakeholder Responses: Importance of Water Use (non-commercial water use (e.g. subsistence agriculture, drinking, washing and/or cooking) or commercial water use (e.g. for large-scale irrigation, waterways, bottling plants, hydro-electric power or muni

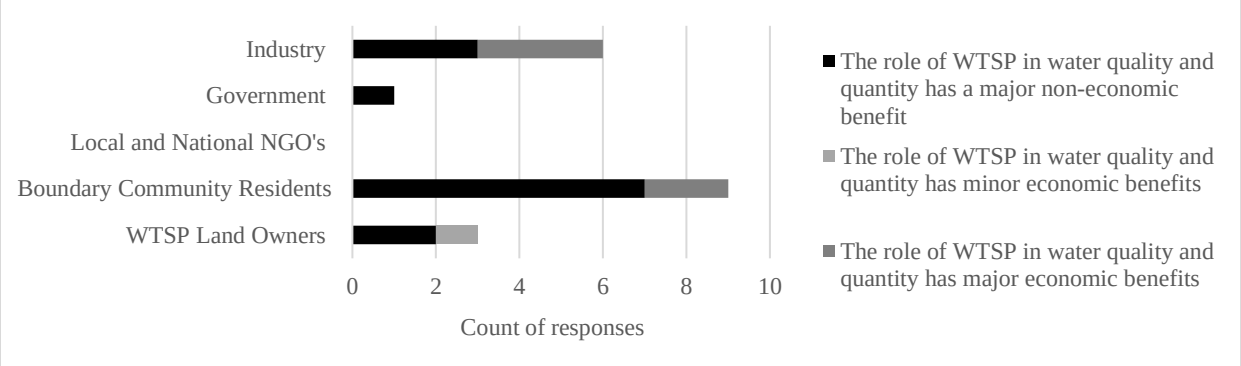

Figure C-6: Stakeholder Responses: Importance of Water Quality and Quantity

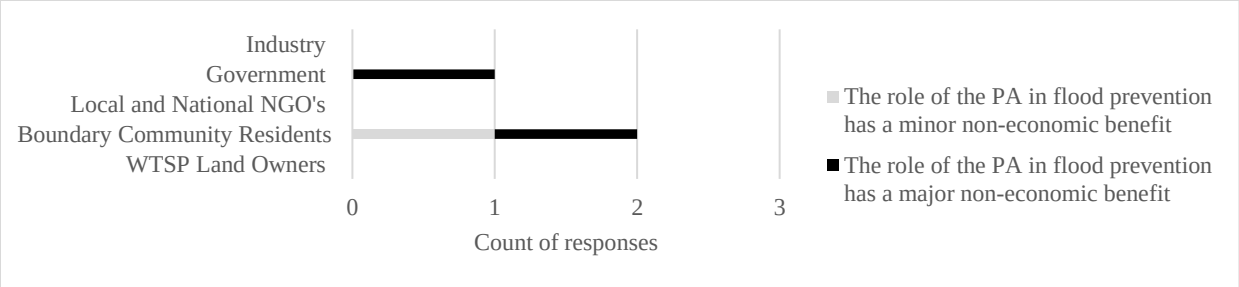

Figure C-7: Stakeholder Responses: Importance of Flood Prevention

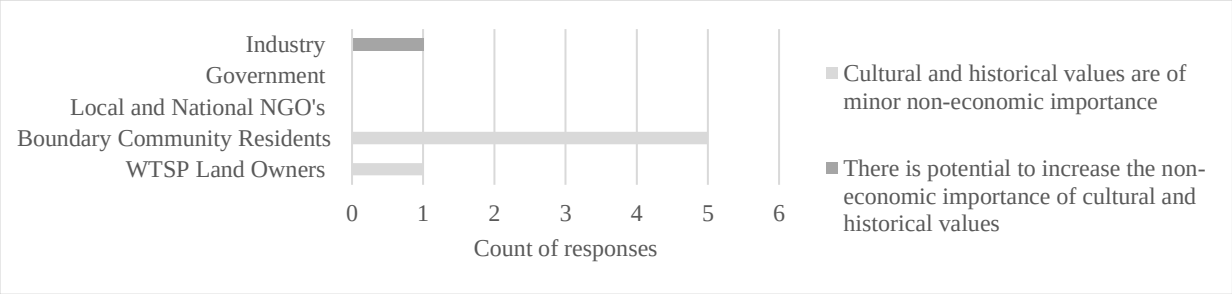

Figure C-8: Stakeholder Responses: Importance of Cultural and Historical Values

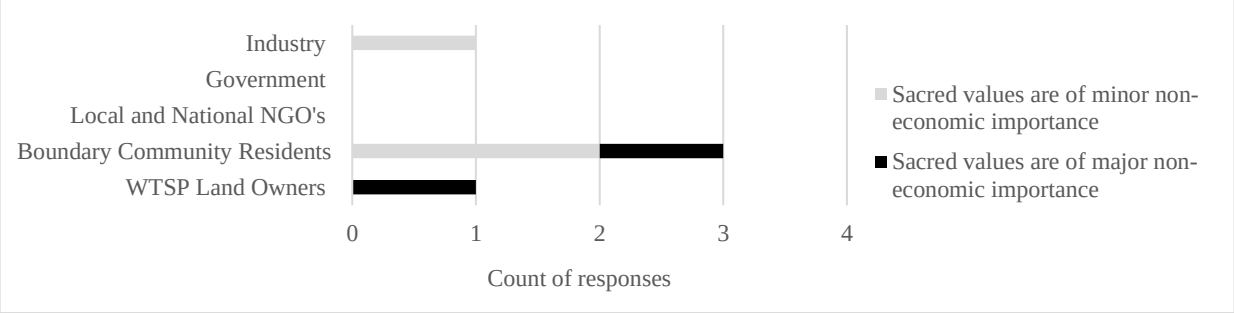

Figure C-9: Stakeholder Responses: Importance of Sacred Natural Sites or Landscapes

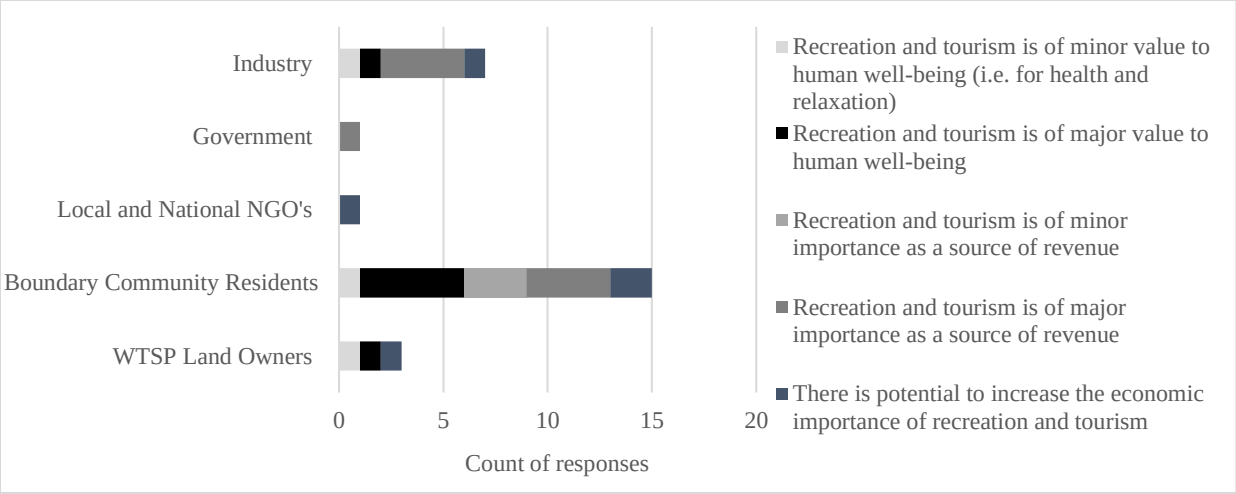

Figure C-10: Stakeholder Responses: Importance of Recreation and Tourism

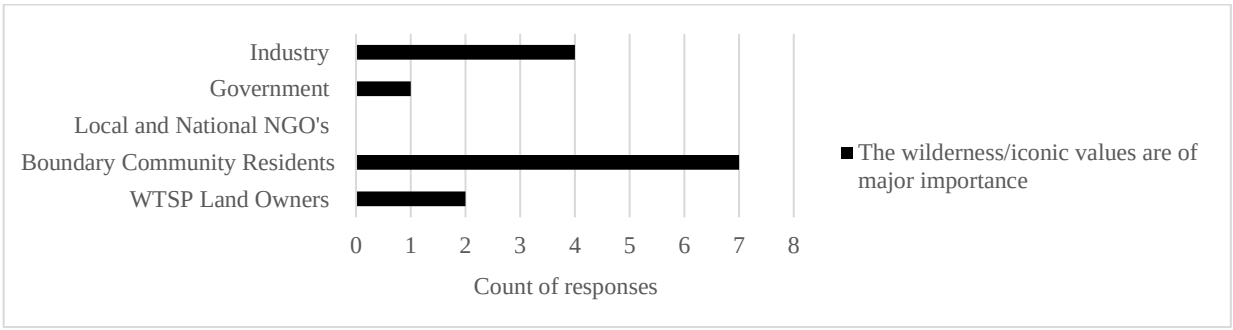

Figure C-11: Stakeholder Responses: Importance of Wilderness or Iconic Values

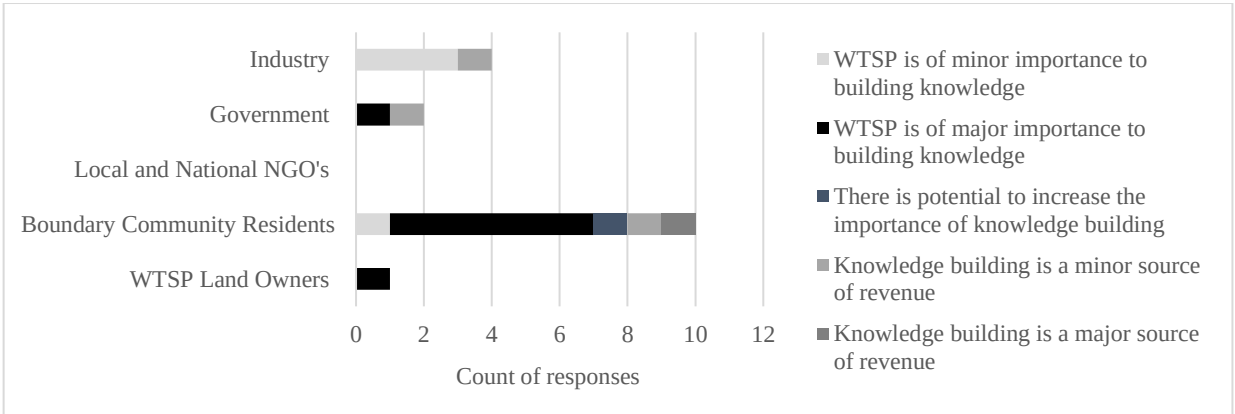

Figure C-12: Stakeholder Responses: Importance of Knowledge Building

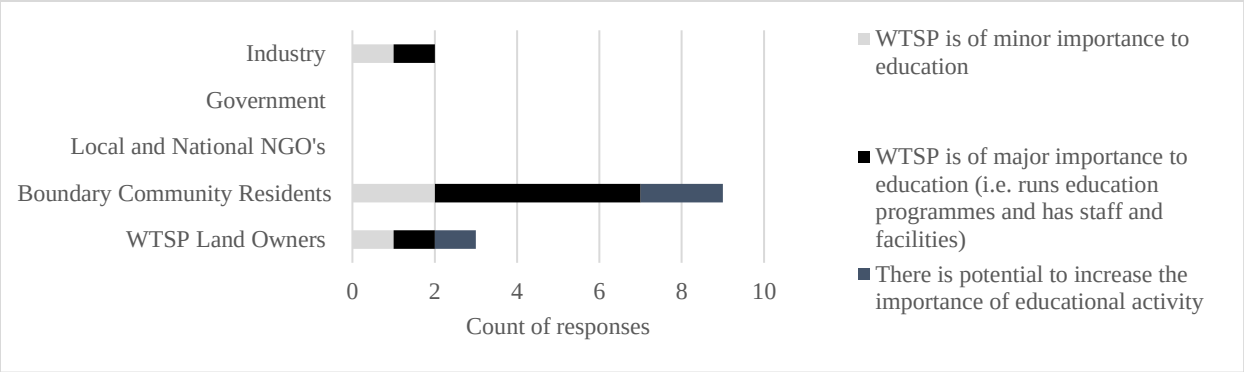

Figure C-13: Stakeholder Responses: Importance of Education

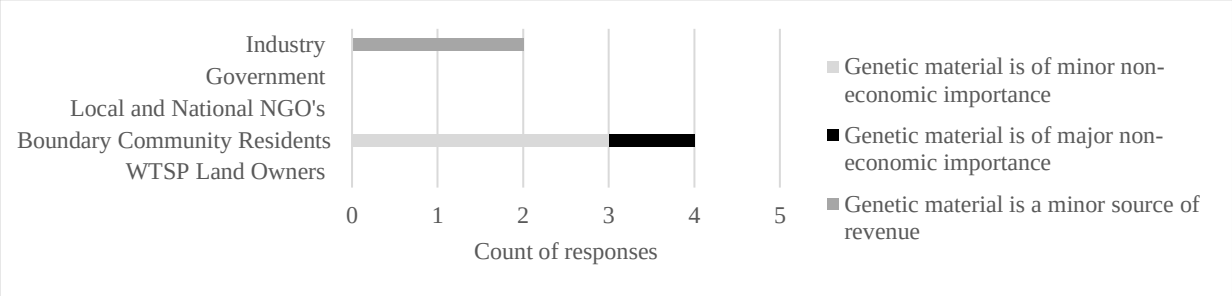

Figure C-14: Stakeholder Responses: Importance of the Collection of Genetic Material

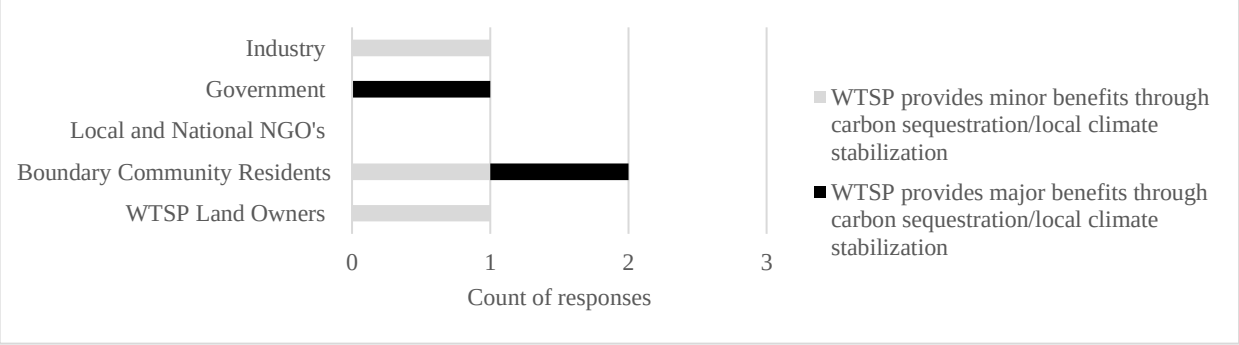

Figure C-15: Stakeholder Responses: Importance of Climate Change Mitigation

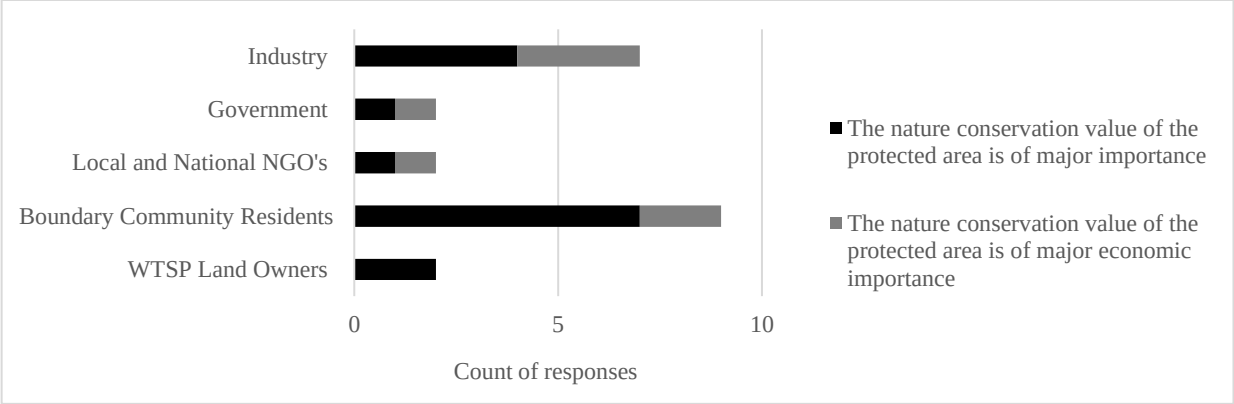

Figure C-16: Stakeholder Responses: Importance of Nature Conservation

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